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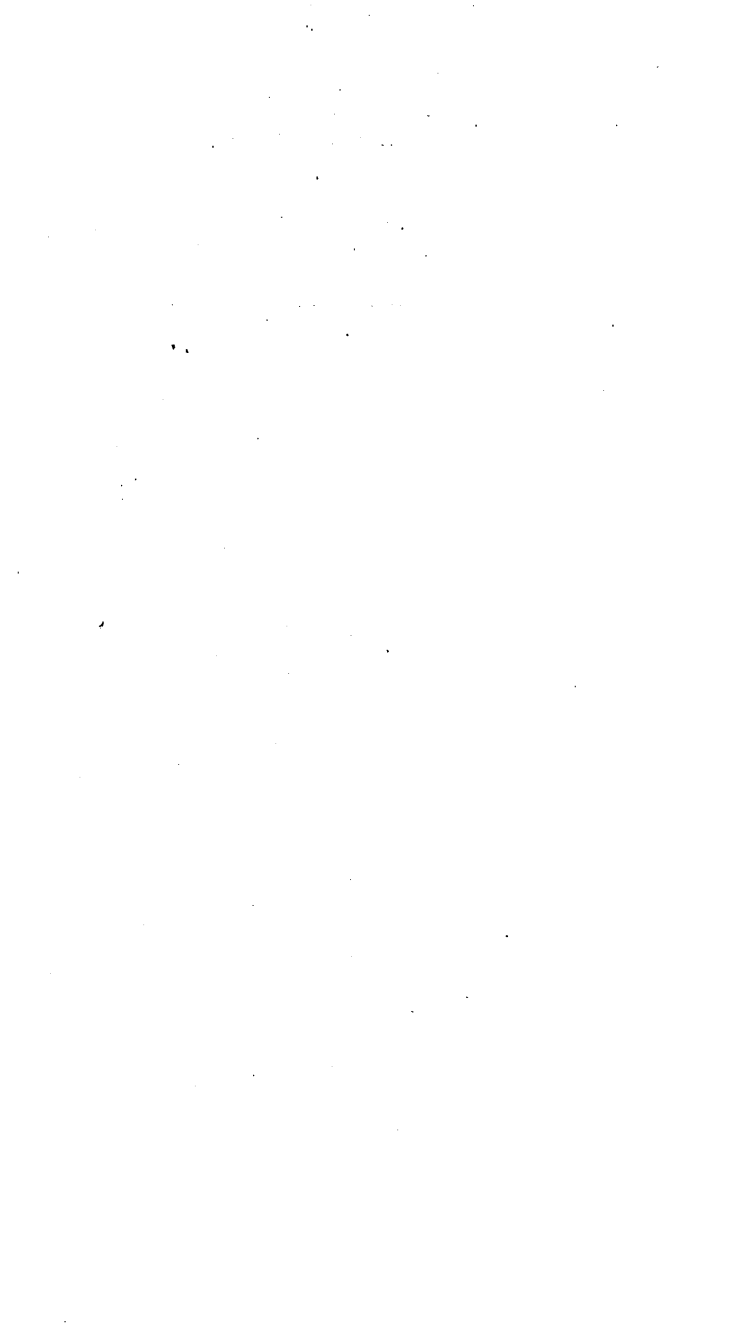
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THE REVELATION OF THE TRINITY.

NEW EDITION.

THE
REVELATION OF THE TRINITY.

S. B. G. McKINNEY, M.A., L.R.C.P., EDIN.,

AUTHOR OF

"THE ORIGIN AND NATURE OF MAN," ETC.

"The mystery of God shall be finished."

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PREFACE.



Is there anything in Nature that explains, illustrates, or suggests the Doctrine of the Trinity? Is there anything of which one can truly say that it is one and indivisible in substance, and yet is three in function? Is there a Revelation of the Trinity?

Profound thinkers of every age have felt convinced that there is a mysterious Trinity somehow governing and pervading the universe; and the idea of the Creator as a Divine Triad is at the foundation of the most ancient philosophy. Would it be possible for man to originate such an idea of the Creator if there is no revelation in Nature, or in himself, to suggest it?

The Hindoo Trinity is sometimes described as Creator, Preserver, and Destroyer; but the Hindoo theologians regarded the Persons of the Trinity as so indissolubly One that their

functions are often interchangeable, and it is impossible to distinguish absolutely between them. A materialist may say that this indefiniteness of conception is characteristic of theology; yet light that enables man to see may also strike him blind, and heat that gives life may also destroy it. Who can mark the boundary between light and heat?

Before men became engrossed with physical science they knew the Creator; and, therefore, they could see clearly the phenomena of mind, though they had not words to describe fluently their visions. They could see intellect and emotion in the mind, though they could only speak of them and their relationship in mind by using the symbols of father and son. When spiritual phenomena are recognised something in Nature can always be found corresponding if the vision is true; yet there may be absolute certainty of the truth without knowledge of the revelation. It is the certainty that causes the search for the revelation.

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THE REVELATION OF THE TRINITY.

CHAPTER I.

VISIONS OF THE THREE IN ONE.

THE intensity of the struggle between those who would have the doctrine of the Trinity taught in all schools and those who regard such teaching as opposed to belief in the Unity of God must increase in proportion to the depth of conviction of the contending parties. The lukewarm and ignorant, who do not care to think of theology, are at present in the majority, and are surprised at the earnestness of those who have seriously studied the subject of controversy; but as

education is spreading the number of thinkers is increasing, so that the arguments for and against the teaching of the doctrine of the Trinity must soon be stated on every platform and in every newspaper. Thus the question will be brought prominently before the world, and the barrier of fog that has so long existed between the Christian and the Jew will disappear before the clearer light.

The Athanasian Creed is a very positive and definite statement; and the unadorned assertions in it seem very unreasonable to many who would willingly profess belief in them if they were more enveloped in ambiguous phrases. The Jew has good reason for expressing disgust at the introductory proclamation, "Which Faith except every one do keep whole and undefiled, without doubt he shall perish everlastingly." It is not easy to defend this sweeping assertion when a pious Jew protests that it is one of the evil remnants of fanatical presumption and blasphemy; and it is difficult to believe that a theologian ever wrote it, or ever

intended it to be taken in the sense in which it is commonly understood.

The writer of the Athanasian Creed must have experienced a profound sense of the unfathomable mystery of being, and therefore of his own lamentable imperfection in comparison with the Holy One; so that he would never dream of attempting to decide who will and who will not perish everlastingly. Dogmatic condemnation of others to all eternity can only seem reasonable to the unsympathetic or the shallow-minded. The great-minded, such as this writer must have been, always feel their own littleness and the infinite greatness of God, and would shrink from posing as the infallible judges even of Cain or Judas. Any man who fancies that it is easy to keep the Faith whole and undefiled must be ignorant of himself and of human nature, and incapable of appreciating the difficulty of judging another.

The intelligent and inquiring Jew is amazed and bewildered when he goes to a Christian Church and hears the Athanasian

Creed solemnly repeated by men and women who profess to be his friends, and who never speak to him of religion as a matter of any importance. Do they really believe that he and all Jews must perish everlastingly? Do they really believe that God is Three and yet One? He can see no hope of any genuine co-operation in religious work between Jews and those who sympathise with the teaching of this which seems the most exclusive and unreasonable of all creeds.

Those who wish to convert him sometimes tell the Jew that he need not hesitate to become a Christian because he cannot understand the doctrine of the Trinity, since that doctrine is only a metaphysical theory which is quite incomprehensible, and which has nothing to do with practical religion. He replies that if it is not of any particular importance it ought to be repudiated, and that then all well-meaning Jews, Moslems, and Buddhists might work with Christians on common ground. Why should not Christians expunge dogmas about the Trinity which

they appear neither to believe nor to understand? The progressive Jew is willing to meet them half-way by acknowledging that Jesus was a great democratic reformer, put to death unjustly by tyrannical priests who refused to recognise the rights of the people. Why should the temporary despotism of a few priests two thousand years ago, when people hardly thought of individual freedom, be allowed to interfere in the present day with the united rational worship of the God of Abraham—the same yesterday, to-day, and for ever?

The Athanasian Creed is the most definite and precise statement of the fundamental principles upon which all Christian theology is based; and therefore it ought to be accurately learned and carefully studied by every one who desires to have a sound knowledge of Christianity. It deserves to be kept in the front of all works on theology. It is as follows in “The Book of Common Prayer” :—

“Whosoever will be saved: before all

things it is necessary that he hold the Catholick Faith.

“ Which Faith except every one do keep whole and undefiled : without doubt he shall perish everlastingly.

“ And the Catholick Faith is this : That we worship one God in Trinity, and Trinity in Unity :

“ Neither confounding the Persons : nor dividing the Substance.

“ For there is one Person of the Father, another of the Son : and another of the Holy Ghost.

“ But the Godhead of the Father, of the Son, and of the Holy Ghost, is all one : the Glory equal, the Majesty co-eternal.

“ Such as the Father is, such is the Son : and such is the Holy Ghost.

“ The Father uncreate, the Son uncreate : and the Holy Ghost uncreate.

“ The Father incomprehensible, the Son incomprehensible : and the Holy Ghost incomprehensible.

“The Father eternal, the Son eternal : and the Holy Ghost eternal.

“And yet they are not three eternals : but one eternal.

“As also there are not three incomprehensibles, nor three uncreated : but one uncreated, and one incomprehensible.

“So likewise the Father is Almighty, the Son Almighty : and the Holy Ghost Almighty.

“And yet they are not three Almightyes : but one Almighty.

“So the Father is God, the Son is God : and the Holy Ghost is God.

“And yet they are not three Gods : but one God.

“So likewise the Father is Lord, the Son Lord : and the Holy Ghost Lord.

“And yet they are not three Lords : but one Lord.

“For like as we are compelled by the Christian verity : to acknowledge every Person by himself to be God and Lord.

“So are we forbidden by the Catholick

Religion to say, There be three Gods, or three Lords.

“The Father is made of none: neither created, nor begotten.

“The Son is of the Father alone: not made, nor created, but begotten.

“The Holy Ghost is of the Father, and of the Son: neither made, nor created, nor begotten, but proceeding.

“So there is one Father, not three Fathers; one Son, not three Sons: one Holy Ghost, not three Holy Ghosts.

“And in this Trinity none is afore, or after other: none is greater, or less than another;

“But the whole three Persons are co-eternal together: and co-equal.

“So that in all things, as is aforesaid: the Unity in Trinity, and the Trinity in Unity is to be worshipped.

“He therefore that will be saved: must thus think of the Trinity.

“Furthermore, it is necessary to everlasting salvation: that he also believe rightly the Incarnation of our Lord Jesus Christ.

“ For the right Faith is, that we believe and confess : that our Lord Jesus Christ, the Son of God, is God and Man ;

“ God, of the Substance of the Father, begotten before the worlds : and Man, of the Substance of his Mother, born in the world ;

“ Perfect God, and perfect Man : of a reasonable soul and human flesh subsisting ;

“ Equal to the Father, as touching his Godhead : and inferior to the Father, as touching his Manhood.

“ Who, although he be God and Man, yet he is not two, but one Christ ;

“ One ; not by conversion of the Godhead into flesh : but by taking of the Manhood into God ;

“ One altogether ; not by confusion of Substance : but by unity of Persons.

“ For as the reasonable soul and flesh is one man : so God and Man is one Christ ;

“ Who suffered for our salvation : descended into hell, rose again the third day from the dead.

“He ascended into heaven, he sitteth on the right hand of the Father, God Almighty : from whence he shall come to judge the quick and the dead.

“At whose coming all men shall rise again with their bodies : and shall give account for their own works.

“And they that have done good shall go into life everlasting : and they that have done evil into everlasting fire.

“This is the Catholick Faith : which except a man believe faithfully, he cannot be saved.

“Glory be to the Father, and to the Son : and to the Holy Ghost ;

“As it was in the beginning, is now, and ever shall be : world without end. Amen.”

The Jew asks the Christian his reasons for these wonderful dogmatic assertions regarding the conditions upon which alone God is willing to accept worship. Would Adam, and Abraham, and the Prophets, be shut out from salvation if they happened to live in the present day ? Has the Creator changed since Abraham was the father of the Faithful ?

The people who gave the world all that it knows about theology must, apparently, be consigned to everlasting misery according to those who repeat the Athanasian Creed.

No doctrine can be accepted by rational men, if it is not in harmony with established principles of science. It is not enough to say that the Fathers taught the doctrine of the Trinity. Who were the Fathers? To the Jew their chief claim to authority seems to be that they lived many centuries ago, when there was no popular press to review their books and point out the blunders in them; and he says that if they were living now they would most likely be found among the pastors of decaying congregations, which they had ruined by their lazy theorising, and their insensibility to the needs of the people. Christians may say that the doctrine of the Trinity was taught by Christ and His apostles; but the Jew wants to know why it was ever taught by anybody, and why the worship of the God of Abraham must apparently be superseded.

An essential property of the mind is the power of noticing differences between things so as to distinguish them from one another. The Creator has designed man to count and discriminate ; and therefore must be offended by any man who says that two can be one. The Jew is commanded to believe that God is One, and also Two, and also Three. The Father and the Son must be regarded as distinct, and yet as One; and though the very terms themselves imply precedence in time, he is told that there is no precedence in time. The Son is begotten of the Father, and the Holy Ghost proceeds from the Father and the Son ; yet he must believe that in this Trinity none is afore or after another ; none is greater or less than another ; but all are co-eternal and co-equal. When he complains that he cannot understand the contradictory assertions, he is told that he must not expect to understand what is incomprehensible. Then he asks, " Why should men lose time and dispute about anything that is incomprehensible ? "

There are eloquent preachers calling

themselves Christians and yet proclaiming openly that the Athanasian Creed is merely an old traditional statement that nobody believes or understands. The Jew must always be on his guard against the preacher who will try to persuade him that he may become a Christian without committing himself to any opinion on the merits of the doctrine of the Trinity. The Christian Church as a whole founds everything upon the Trinity in Unity; and the Unitarian is only a stray deserter on the outskirts of the army. In fact, the Jew who fancies himself already a Christian because he recognises Jesus as a persecuted and martyred reformer, and an eminently good man, is like a man taking up his abode in an outhouse under the delusion that he thus becomes a member of the family which owns the outhouse.

With regard to their attitude towards the doctrine of the Trinity the public interested in religious questions may be divided into three classes. Those without spiritual sense describe it as a meaningless myth; so that to imagine a revelation of it is absurd.

The second class comprises those who profess to be Christians, but think they can be so without worshipping the Trinity in Unity, and the Unity in Trinity. They protest against creeds, and say it is enough to worship God as the Infinite Creator, and to accept the teaching of Christ as the best that has ever been given to mankind. Their favourite definition of Christianity is that it is a life, and not a system of dry dogmas; for they fail to understand that the life to be healthy must be governed by the dogmas. They have no clear idea of what they mean by worship, and are liable to be blown about by every breeze of fancy; while any attempt to reduce theology to scientific form, or to seek for the revelation of the Trinity, seems to them to savour of blasphemy. A luminous fog is their ideal of clearness.

The third class is composed of those who worship God with the understanding as well as with the heart; and who consequently form the reliable framework of all the churches. They know that the whole

superstructure of Christianity is founded upon the doctrine of the Trinity ; though they are unable to find symbols in the physical world by which to give adequate expression to their spiritual knowledge, and to fix definitely the scientific basis of religion.

Every Christian teacher feels that he must illustrate his doctrines by something analogous in Nature. Sometimes it is said that we have a complete analogy or revelation in the threefold nature of man as spirit, soul, and body ; but this analogy is soon shown to be defective for educational purposes. If we describe spirit, soul, and body as absolutely one and indivisible in substance we are asserting that spirit has length and thickness like body ; or else that matter is in its essence spiritual. Yet there is a profound truth in the comparison, as there is in the comparison with light, heat, and motion ; since the Three in One may be found pervading all Nature.

The great lack of clear ideas and sound knowledge of fundamental principles was recently manifested by a preacher who said

in one of the most important pulpits in London that a simple rose provides us with a perfect analogy of the Trinity ; since in it we have, firstly, the Divine mystery of the life pervading all ; secondly, the visible form in which the life is embodied ; and thirdly, the subtle perfume which emanates from the flower. A student wishing for information is thus asked to believe that the life, the material form, and the perfume are the same in substance ; though how life can be substance, or perfume life, is a greater mystery than any preacher or prophet ever attempted to explain. Sound knowledge of theology seems much more rarely found in the present day than it was a century ago ; when a congregation of Scotch peasants would have demanded an investigation into the teaching of the colleges if a student had compared the work of the Holy Ghost to the influence of the perfume of a flower. The perfume is not proof of the value of the plant.

The study of Nature and of Science has brought men back to a longing for definite

truth, and for a knowledge of the foundations upon which they are invited to build. Christianity is no longer accepted without question, and no fundamental principle is regarded as sacred by the modern critic. Such profound doctrines as the Trinity and the Incarnation are made subjects of discussion in the daily press, so that the Athanasian Creed seems likely to become a bone of contention between rival politicians who have not the remotest care for the meaning of the words they are repeating; and it is certain that every dogma must either be proved compatible with reason or be expunged from every book intended for public instruction.

The denunciation of ancient creeds may be evidence of independent thought and honest doubt; but it is more frequently evidence of deficient reverence and conceited ignorance. Most of those who try to criticise the dogmas of the Church are like uneducated sailors puzzling over the works of mathematicians and astronomers. The sailor may be ignorant

of the precautions necessary to provide him with a reliable compass, and of the principles involved in the construction of his sextant, and he may even be incapable of learning the mathematics and astronomy essential to the compilation of his nautical almanack ; yet if he humbly recognises his ignorance, and uses the compass, and sextant, and nautical almanack, according to the rules laid down for him, he may succeed in safely circumnavigating the globe. Those who fancy themselves wise and experienced because they have rowed a boat on the pond of a city park may tell him that the earth is flat, that there cannot possibly be any poles, that the compass is an antiquated toy, and that the statements of astronomers are baseless delusions ; yet he may feel quite sure, with sound reason, that his would-be teachers are shallow fools. He may not be able to talk so fluently as they do, or to explain why he is sure of the truth of the principles upon which the calculations have been based ; but when he has proved those principles reliable

in extreme emergencies in which nothing else could avail, he finds it impossible to doubt their truth. "They that go down to the sea in ships, and do business in great waters," cannot listen with patience or respect to the opinions of those to whom street lamps are larger and more important than heavenly constellations.

Religious teaching which is not based on creeds, or systematised theological truths, will prove incoherent, inconsistent, and utterly unreliable in the hour of trial. No heavenly observations or profound calculations may be needed to secure safety on a placid lake in the day-time, but when the mariner is tempest-tossed on a dark and unknown ocean, he anxiously studies the charts, and blesses the theorist who taught him to find his position by the aid of the stars; and he then learns how important it is to test thoroughly the knowledge, judgment and experience of a man before permitting him to act as a professional sky-pilot.

As knowledge increases all the ocean becomes like inland water, since the educated eye is assisted by science to see from continent to continent, and the philosopher on the shore is able to construct machinery and provide rules by which the uncertainty of winds and waves may be almost overcome ; so that experience seems of less importance to the navigator than obedience to authority. The official teacher of theology may have acquired a sound theoretical knowledge of fundamental principles, and may be very valuable as an instructor, even though his experience may be very limited ; yet he must not despise the wisdom and counsel of the man who simply says that he knows because he has seen. Those who have received only the rudiments of theoretical education may have learned by experience the completeness and unity of the theology which has never failed to provide them with satisfying thought and confident hope, and which has infallibly predicted the consequences of error and revealed the remedy for sin. When an individual has

tested by experience the method laid down for producing happiness, and has proved that it is thoroughly effective when all other methods were useless, he cannot attach any importance to the objections of those who know nothing of the method except by hearsay; and yet he ought to study how best to give a reason for his confidence. Theory and personal experience must work together for the regeneration of mankind; for while the mariner cannot find his way in safety without a knowledge of the heavens, the astronomer may be of little use in a storm; and the crew may well feel anxious if their captain has never been out of smooth water.

There are some who think it possible that each nation should have a religion peculiar to itself, or in harmony with its own distinguishing characteristics. Truth is supposed to be divisible into fragments, so that each nation or sect may select the fragments most agreeable to the appetite; but when men have not a certain standard of justice or morality every one is guided by his own imperfect

judgment, and the number and nature of the idols will vary with the number and vagaries of the worshippers. There cannot be one mariner's compass for Europe and a different one for Asia. God is One. Science cannot tolerate a rival. Chinese notions of astronomy and geography are seen to be ridiculous when the mind is enlightened; and all false and imperfect systems of religion must vanish when the scientific system is clearly recognised.

Those who are responsible for the education of the people have always to bear in mind that the stability and progress of society, and the happiness of mankind, depend upon the religious principles which are accepted as the basis of conduct; and that, generally speaking, the principles which most influence the lives of men are those instilled into their minds in childhood. What fundamental religious principles must be taught in the schools? Every child tries to imitate an ideal, and to gain happiness by the imitation. Consciously or unconsciously every man has

an object of worship ; and whatever he really worships is that which he regards as most worthy, or as the ideal deserving of *worship*. By observing the life of a man we may often construct an idea of his supreme ideal, or god, more definite than he himself has ever formed ; and we may also see the flaws in his idol to which he himself is blind.

Every society depends for the possibility of its existence upon the recognition of a common ideal or god ; for the man who has no god must necessarily be a law unto himself, and no other person can feel sure of his co-operation. The universal brotherhood of man is merely the expression of the worship of the One Father. Anarchy is the inevitable result of the failure to agree as to what is most worthy, or as to the ideal or god to be worshipped. Self-reliance and independence of thought are the birthright of every man ; and yet if each individual has a different notion of the appropriate name for an object, and insists upon adhering to his own name for it, confusion of tongues must result, so

that when one asks for bricks another thinks he means mortar. That nation must be strongest whose members are in most complete accord with the best ideal. The unity of the nation depends ultimately upon its religion. What must the children be taught about God ?

All differences of belief among honest men are due to misunderstandings. There can only be One true God ; and all true men must be trying to worship the true God. Why cannot they agree ? It will be found on examination that most disputes about religion among seekers of truth are caused by failure to define the words employed in discussion. If the sincere and honest worshipper of the Trinity could explain clearly to the sincere and honest Unitarian what he means by the worship of the Trinity, there would no longer be any misunderstanding or ground of dispute between them. The Moslem fancies that the worship of Three Persons must be an insult to the Supreme Ruler, and therefore he feels it his duty to regard the Christian as

a blasphemer and idolater ; but if the Christian and the Moslem would both try to worship the God of Adam, and to see clearly what they mean by the terms God and worship, they would soon find that in their apparent opposition they have been trying to do the same thing.

Men need to try to see clearly from the same point of view and in the same light. The difficulty is that, in order to see clearly, they must rise above the fogs of earth, and must strip themselves entirely naked ; and there are few who are willing to submit to the conditions necessary for distinct vision. Even the most devout and earnest refuse to divest themselves of the ornamental, encumbering dress of words which they have spent years of serious toil in constructing or accumulating ; and they are not willing to believe that God had the most confidential conversations with Adam before the man had any clothing.

The description of God as Father, Son, and Holy Ghost is quite satisfactory to those who have sound Christian knowledge ; but it conveys no idea to the mind of the merely

intellectual man, nor to many sincere and earnest men who are anxious to study theology from an intellectual point of view. Even a child has a right to ask for an explanation of a dogma; and when he feels that he is too ignorant and weak-minded to understand the explanation, he is content to accept the statement on trust until he has grown in knowledge and ability. Admitting that the created object must be to some extent a revelation of the Creative Mind, how is the notion of Three Persons in the Godhead obtained? It is revealed to those who have true spiritual vision; and no human power can confer vision. Those who can already see will not see any better when taught the laws of optics, while no statement of physical truth can show a spiritual world to the animal man; yet knowledge of the laws of optics is necessary for the satisfaction of the student of science.

The perception of spiritual truth does not depend on knowledge of the physical universe, and so an ancient theologian who had sound and cultivated spiritual senses, could see the

phenomena of mind clearly without much knowledge of physical science ; and yet the ability to teach spiritual truths to others who have spiritual senses depends very much on the possession of the knowledge of the physical universe which can illustrate the truths. Nature remains an insoluble puzzle without knowledge of God ; and yet knowledge rises from Nature up to God. If Nature signifies the sum total of all created things, then the most important part of Nature is the human mind, which is made in the Image of God. Knowledge of God becomes clear and definite in proportion to our knowledge of Nature ; but he who tries to understand Nature without studying himself is trying to build the Arch without the Keystone.

Every child naturally finds his greatest pleasure in the society of his parents, and desires to learn to appreciate their language and thoughts. The more he learns of the thoughts of his parents the more satisfying is his converse with them ; yet in childhood he rejoices in their society and in

listening to their conversation, though he does not know the meaning of the words employed. Wise parents do not refrain from serious talk in the presence of their child because he does not understand them, and they even teach him dogmas quite incomprehensible to one who has no experience of the world ; knowing that the true dogma will be as a seed sown in the mind which will grow and develop throughout life so as to be a source of life-long strength and gratification. Dogma without experience is dead ; but children ought to be taught fundamental dogmas, around which their thoughts may centre and develop. He who has soundest dogma, greatest knowledge, widest experience, and most comprehensive sympathy, can enjoy fullest communion with the Creator.

The modern scientific student has many difficult problems to consider regarding the origin of language, religion, and civilization ; and one of the most interesting of such problems is the meaning and origin of the belief that there is a mysterious Trinity

somehow governing and pervading all the phenomena of the universe. Apart altogether from Christian teaching, there is the fact that the concept of the Deity as a Triad of Divine Forms is at the foundation of the earliest Hindoo mythology, while the same idea is found in the most ancient philosophy of Egypt. How can such an idea have originated, and why is it accepted as true by multitudes of intellectual scholars as well as by practical truth-loving peasants? No animal naturally accepts food as wholesome and satisfying unless the food is really genuine; and intelligent, honest men cannot feel satisfied with a dogma unless it is true.

The concept of God as Three in One is the foundation of all Christian theology; so that the conversion of all Jews and Moslems to Christianity depends upon the possibility of convincing them that there is nothing unreasonable in speaking of something which is one in substance and yet is three in function, and in proving to them that the worship of the Divine Trinity is compatible with the

purest monotheism, and is essential to the most complete possible idea of God. The recognised leaders of Judaism warn their people to beware of thinking that any theological compromise is possible between Jews and Christians, and urge them to remember that it is even doubtful whether they pray to the same God; since God cannot be One in the Jewish sense and Triune in the Christian sense at the same time. The orthodox Jews and Moslems look upon Christianity as a modification of heathen polytheism; and missionary work among them is paralyzed by the inability of Christian teachers to explain the meaning of their dogmas, or to reconcile the worship of the Trinity with the worship of the God of Abraham.

There are now few teachers who openly reject the evolution theory; and those who believe in the descent of mankind from brutes cannot be expected to have any reverence for the opinions of their forefathers. To the evolutionist, the intellect of the man of the present day must seem superior to the

intellect of his ancestor of a thousand years ago ; yet ancient creeds and dogmas are taught as if their mere antiquity should give them authority. Modern legislators appeal to the old commandments of Moses ; modern mathematicians accept the axioms and reasonings of Euclid ; and modern theologians repeat the Creed of the time of Athanasius. The ancients provide the foundations.

One of the most remarkable results that may follow increase of knowledge is decay of thought. Wealth tends to cause degeneration. When young men are supported by the artificial aid of words and conventions they do not feel inclined to exercise their own mental and spiritual muscles, which, in consequence, remain weak or undeveloped. Thus it happens that modern critics of an ancient writer will devote their attention to an inquiry into such matters as his parentage, and his birthplace, and his pronunciation, and his spelling, and anything of the nature of gossip regarding him, while they remain ignorant of his meaning ; just as boys foolishly

reared expect praise at an examination in geometry because they know something of the family history of Euclid, though unable to solve the simplest of his problems. Stranger still, such critics are called "higher" critics, to distinguish them from expositors of thoughts.

A student of the science of theology cares little who was the writer of the Athanasian Creed, or in what age he lived, or who agreed with him, or how many quarrels the Creed has caused. He wishes to learn the meaning of the dogmatic assertions, and the reasons for believing them. Is the Creed the necessary result of a lofty conception of the Divine Being?

Competition compels men, and nations, and sects, to respect one another; and increasing knowledge of the world has made Europeans ashamed to repeat the Athanasian Creed, or to claim a monopoly of wisdom and holiness. A Hindoo student of European history may be taught very exalted notions of the glories of the Tiber; but when he

visits Italy he finds the famous river little more than a ditch when compared with his own Ganges. What must be the thoughts of a Chinese philosopher when he hears of a religious sect in Europe which maintains that all mankind outside its dogmatic circle shall without doubt perish everlastingly? He may say to himself, with a sphinx-like calm, "The Kingdom of God is within you;" or, perhaps, he may have a feeling of indignation at the presumption of those who would pretend to stand between him and the Creator.

Christianity is essentially a missionary religion; yet for the past fourteen centuries there has been failure to convert Moham-medans. Why is the missionary so impotent when opposed to the Moslem, who is so emphatically deprived of all hope of Heaven by the Athanasian Creed, and who is yet so absolutely certain of being the true child of God? The Christian does not realise the standpoint of the Moslem. It is often assumed that the establishment of schools

and the improvement of education will induce Moslems to abandon their faith, and convince them of the superiority of the faith of Christians; but it is forgotten that there are many highly intellectual and accomplished followers of Mohammed, and that they have contributed largely to human progress in the past both in art and in science. The Moslem historian regards the defeat of the Moors in Spain as a national and a world-wide calamity. Education causes the Moslem to maintain that Mohammed was a prophet sent by God to denounce the revival of the pagan worship of the Queen of Heaven, and to roll back the flood of polytheism and idolatry which was sweeping over the world as the result of the amalgamation of paganism with Christianity under Constantine; for, to the Moslem, there is in such countries as Italy and Spain a god in every village and an idol in every house, just as in the days of paganism, only with the difference that the local deity is given the name of some dead Christian. The educated

Moslem regards Mohammed as the true worshipper of the God of Abraham, and Solomon, and Jesus; and as the prophet of the Infinite One.

Temples in the East are built according to the same principles of construction as temples in the West; and the mason may be expert in the use of the level, and the plumb, and the square, and may be able to make the best bricks and mortar, though he has no theory regarding gravitation or chemical affinity, and though he is ignorant of the conventional terms for describing the tools and processes he employs. Experience even proves that the man with the greatest fluency of words is generally the worst workman.

However the point of view and the language may differ, all genuine spiritual builders prove by their life that character is formed and progress secured by the harmonious culture and co-operation of thought, feeling, and action, as a Trinity in Unity. There is no more doubt as to the principles upon which religion and morality depend than

there is as to the laws which govern the stability of material buildings. God is not far from any who seek Him in sincerity and truth ; and He may reveal Himself most clearly to such lonely worshippers as Abraham, and Job, and Confucius, and Buddha, and Mohammed. All genuine worshippers would agree if they could only state definitely what they mean, and if they would sympathetically try to understand one another.

God is not known by reasoning, nor by learning, but only by spiritual vision. Meditation in solitude upon the Creator as existing and planning outside the universe, and as working through all things, may produce a sudden illumination of Husband, Wife, and Child, as glorified Archetypal Forms behind the mystery of Being ; and thus the Deity is thought of as Two Persons in One, or as a combination of the Masculine and the Feminine. Hence the tendency to worship Venus, or Juno, or some Queen of Heaven ; and the consequent tendency to sink into materialism, sensualism, and idolatry.

The psychologist sees man as composed of intellect, emotion, and volition, (or he may use the terms reason, feeling, and will), mysteriously independent, yet united in one mind; and the Creator is then necessarily thought of and worshipped as Perfect Intellect, Perfect Emotion, and Perfect Will. Some may say that the best man is he who worships the True, the Beautiful, and the Good; and they may not reflect that the True is known by intellect, the Beautiful is enjoyed by emotion, and the Good is the work of the will.

True worship must aim at producing perfection of character; and it may be said that the perfect man is he who is perfect in Honour, Fidelity, and Benevolence. The perfection of Honour implies the perfection of truth and justice, which can only be attained by the worship of Perfect Intellect. The perfection of Fidelity implies the perfection of self-sacrifice, recognised by the worship of Perfect Emotion. Perfection of Benevolence implies perfection of will, which

can only be attained by the worship of Perfect Will in the Divine Mind.

A man looking from another point of view may say that the true worshipper is he who seeks Wisdom, Beauty, and Strength. The perfection of Wisdom can only be found by the intellect in harmony with the Divine Intellect. The perfection of moral Beauty is the character in harmony with Divine Emotion. The perfection of moral strength is the will conscious of acting in harmony with the Divine Will.

Those who are thinking of the results of true worship may say that the great ideals must be Truth, Peace, and Concord. No man will maintain Truth except by the aid of Divine Intellect. No man promotes Peace but he who worships Divine Emotion as Love. There cannot be permanent Concord except as the result of will acting in obedience to the Divine Will.

Spirit, Soul, and Body must unite, incomprehensibly, in one individual; and to some minds this seems the most satisfying

illustration or revelation of the Divine Trinity. To test the illustration we must substitute in the Athanasian Creed the word Spirit for Father, the word Soul for Son, and the word Body for Holy Ghost.

A man with spiritual vision who devotes himself to physical investigation may see Light, Heat, and Motion as shadows of the Three in One, quivering through the immaterial to the material as correlating forces all equally incomprehensible, implying one another in indivisible unity, yet requiring to be studied as if distinct and independent,

It is a fundamental necessity of reflective intelligence to perceive the Creative Mind as a mysterious Trinity in Unity, manifested in thought, feeling, and action. Some may speak of God as perfect in Wisdom, Love, and Might; others may think of Him as infinite in Power, Love, and Purity; others regard Him as the source of Righteousness, Peace, and Joy. There is always the three-fold complexity; and men long for the attributes and gifts of Intellect, Emotion, and Will.

A savage will eat sugar with satisfaction and benefit without knowing that every particle is composed of oxygen, hydrogen, and carbon, or that it contains the potentiality of light, heat, and motion; he may be clever, healthy, and strong, without knowing that he is so by the harmonious culture of brain, nerve, and muscle; and he may be a noble character without ever having thought of the importance of preserving proper relations between intellect, emotion, and will. His teacher may be puny, dyspeptic, and discontented; yet the savage is counted wise for accepting the dogmas of the miserable invalid on chemistry, physics, physiology, and psychology.

In order to illustrate most fully to others what we mean when we speak of the most profound spiritual phenomena we must understand the most profound physical phenomena; for it is the physical which provides the symbols and the language to describe the mental. The physical revelation or material embodiment must correspond in depth of

design and intricacy of detail with the thoughts or ideas embodied. Man is the final product of the work of the Creative Mind; and therefore the human body must correspond to the most profound thoughts of God revealed in His work, and must provide the illustrations to explain the most profound spiritual truths. Man is the Shekinah, or the visible symbol of Jehovah. The human mind was made in the Image of God; and the body provides the revelation of the mind. Hence psychology and physiology must contain the means of illustrating the truths of theology and religion.

Mere scholars may believe that knowledge ascends from the material to the spiritual, as they suppose that man ascends from the brute to the human; and those who have spiritual vision sometimes fancy that knowledge of physical truths may enable a man to perceive the corresponding spiritual truths. Experience proves that knowledge of the physical never confers knowledge of the spiritual; but that concentration of attention

upon the physical raises an impenetrable barrier to spiritual vision. There must be a moral idea of rectitude before a square can be seen as a symbol of ethical value. The raising of millions from the dead would not assist a Pharisee to recognise the Christ. All discussion of theology with men who are destitute of spiritual vision is like the casting of pearls before swine.

By looking steadily at man in the light of the Creative Mind the intellect is seen at work as the brain of the soul or spiritual body; the emotions as its nerves; the will as its muscles; the memory as its blood, with facts floating as blood corpuscles; the imagination as its breath, and the spirit as its life. Facts of physiology are thus seen as symbols; but they have no symbolical significance or spiritual meaning to the mere physiologist, who cannot realise or believe that phenomena of mind may be known with more certainty than functions of the body. There can be no revelation of the Divine Trinity in Nature to any man who does not

already know the Creator as Ruler, Preserver, and Instructor.

In order to be a reliable teacher a man must either have sound knowledge of himself, or have enough humility to accept the teaching of his superiors. Athanasius is supposed by the ignorant to have been an obstinate, self-conceited fanatic when he declared that he would profess his belief in the Trinity though the whole world were against him ; and yet his position was simply similar to that of a physiologist among a nation of savages who would not believe that there are nerves and muscles in the body. The physiologist could not doubt the fact, even if he tried to. The savage shows his folly by refusing to accept the teaching of those who know.

All honest rational men would have the same religion if they would only consider intelligently what they mean by such expressions as God, worship and religion. They have only to recognise that God is the Infinite Mind, the Heaven-Father ; that

worship, besides implying awe and reverence, means the endeavour to become like the Perfect Mind ; and that religion is the science which treats of the cultivation of the mind to the absolute health of perfection. As the test of the truth of medical science is the health of the people, so the test of the truth of religion is the possession of salvation, made evident by the prevalence of righteousness, peace, and joy, through working in harmony with the Perfect Will.

No system of religion can be worthy of the attention of a scientific student if it does not aim at the production of salvation, or health of mind. It is not enough to be lulled into a stupor, or to be kept in a state of intoxication, or even to be consciously free from pain. There must not only be the peace of satisfaction, but there must be the joy of strength; and therefore the mind or spiritual body must be thoroughly and harmoniously cultivated. Now, the mind is composed of intellect, emotion, and will, which are one and indivisible in substance, and yet are separate

and distinct in function. No religion can be scientific which does not teach the worship of Intellect, Emotion, and Will as Three Persons in One God. Emotion must always be recognised as subject to intellect, and even as sacrificed at the demand of intellect, as nerves must be subject to brain. The mind cannot become perfect except by the equal cultivation of intellect, emotion, and will, as the body cannot become perfect except by the equal cultivation of brain, nerves, and muscles.

The time has now arrived for the Millennium, when there will be no more doubt, or misunderstanding, or dissension among spiritual men, and when the knowledge of Truth shall cover the earth as the water covers the sea. The Christian, the Jew, the Moslem, the Parsee, the Brahman, and every man conscious of possessing a spiritual body, will unite in worshipping The Elohim, and in recognising the Triune God as Jehovah the Deliverer; while the worshippers of the Baalim will be manifestly animalised. Differ-

ences of language will no longer keep apart those who are one in spirit. Divine Intellect must be worshipped as the Father, infinite in power, wisdom, truth, and justice; Divine Emotion must be worshipped as the Son, subject to the Father and obeying His commands; and Divine Will must be worshipped as the Holy Ghost, proceeding from the Father and the Son, and revealed by deeds of justice, charity, and benevolence.

“To Father, Son, and Holy Ghost,
The God Whom we adore,
Be glory, as it was, is now,
And shall be evermore.”

CHAPTER II.

THE UNITY OF THE BODY.

PHYSIOLOGY is the science which treats of the functions of the body, from its primitive appearance as a particle of apparently unorganised protoplasm until its dissolution by death. The scientific physiologist must first by observation and experiment determine what are the functions of the body; and then he must classify the functions, and endeavour to discover what are the primary functions. There is only the one method of studying the subject scientifically.

The attempt to classify the functions of the body is also an attempt to make a division of the body according to function; so that the physiologist is engaged in trying to divide the body according to a totally different principle of division from that

adopted by the anatomist. The anatomist may be satisfied to say that one part of a machine is wood, and another part iron, and another part leather; the physiologist sees one part intended to support, another part intended to transmit force, another part intended to alter the direction of the force. The anatomist may only see before him a particular structure; the physiologist must see a living organism.

Science can only progress by the logical classification of ascertained facts; and the triumph of science consists in the reduction of all its facts under one general law. The aim of the scientific physiologist must be to prove that all functions are modifications of one primary function; but if this were done future generations would have little opportunity of exploring unknown regions. The circle would be completed.

Man is the most complex machine that can possibly be imagined, since he was designed by the Almighty. The science of medicine depends for the truth of its

principles and the success of its practice upon the accuracy of its discrimination of the parts of the human machine and of their relations to one another in function. If the surgeon has not a sound knowledge of the anatomy of the body, it is dangerous to permit him to meddle with it when the parts are deranged ; and no conscientious, sensible man would attempt to repair a valuable machine without having first mastered the relations of its constituent parts. If the physiologist fails to provide a clear statement of the functions which the various parts of the body have to perform, and of the manner in which the functions affect one another, the physician has no certain guide in his attempts to restore functions that are weakened and to repair those that are deranged.

Thus medical science looks anxiously to physiology for definite teaching regarding the functions of the body and the relations of the functions to one another. Many of the finer and more complicated portions of

the machine may be excessively difficult to understand in their influence upon one another and upon the whole, but we must at least have certainty regarding the great central and vital portions. The material suitable for repairing a weak spot in the engine may cause destruction of the machine if it is used to repair a leaking electric conductor; and the drug that soothes the brain may be very injurious to the stomach. If we could only arrive at a scientific classification of functions, and a scientific classification of drugs according to their influence upon function, we should be able to use drugs scientifically, and there would be a perfect science of medicine.

The unreflecting savage is disposed to look upon his body as a unit, but circumstances compel him to reflect; for he soon learns that sour food affects his stomach, while alcohol, which may relieve the pains in his stomach is apt to affect his head. He is compelled to think of himself as a complex being composed of parts which must all work

in harmony in order that he may enjoy health. So long as men neglected to study themselves, and saw in the body only an incomprehensible unit, there was no possibility of a science of medicine. All parts of the machine were alike mysterious, and when disease seized upon it no one could say whether it was better to repeat incantations over the sufferer, or to rub mud upon his skin, or to give him powdered insects to swallow. A man suffering from colic seemed to be possessed of a devil which tormented him, and which might attack others who ventured near. No one could tell what drug might appease the demon.

The intelligent child is naturally desirous of investigating the manner of working of his father's watch and of examining all the parts separately so as to discover the use of each. The same child when grown up is naturally desirous of learning the parts of which the human body is composed; but horror, and dread, and awe must be overcome before a dead man can be studied like

a watch. Love conquers all ; and the anxiety to relieve suffering overcomes the repugnance inspired by the touch of a corpse. The spirit of the pioneer anatomist had to be so much superior to all material things that he felt himself to be independent of them, and was able to look upon the dead body as the cast-off shell of a soul. Hence the theologian was the anatomist ; and Moses was the typical physician.

As knowledge of the parts composing the body increased, it was found that Nature provides medicines to act peculiarly upon different parts. Some drugs were found to act upon the bowels so as to cause purging, and others so as to cause constipation ; the bilious appearance and depressed spirits associated with congested liver were found to disappear under the influence of some seeds and roots ; opium was found to have a marvellous effect in relieving pain and in giving a sense of comfort to the despondent sufferer. Those who had faith believed that Nature provides a remedy for every disease ; but

they found that, though Nature is infinite in resource, man is infinite in complexity and limited in capacity. The drug that acts beneficially in restoring the impaired function of one part may act injuriously upon the function of another part if means are not taken to limit its action. The supply of food for the mind cannot be exhausted, and no man can comprehend all the wisdom of God. Hence there is still something for the physiologist to discover.

There is no possibility of treating disease with scientific certainty until there is a scientific classification of the parts of which the body is composed, or a scientific division of the body. If there are several distinct primary portions, or functional elements of the machine, it is of the utmost importance to recognise the fact; for each primary part must be treated according to its nature, and we must know the relations of the parts in order to correct any failure of the harmonious working essential to health. Each primary part may have many subordinate parts, which

we can study at leisure when we know the main division to which they belong.

The anatomist and the physiologist have both attempted to arrange the parts of the body in different groups, or to make a division of it into primary parts. Is it possible that there can be several primary elements in any way independent of one another, and requiring special study and treatment? Is any scientific division possible?

The anatomist began by arranging the various parts into a number of groups loosely connected by some apparent resemblances of form, or structure, or density, or other variable property. Thus bones might easily be classed together owing to their common physical properties; the liver, pancreas, and spleen might be classed together as internal organs without a central cavity; the stomach and intestines might be classed together as internal organs with a central cavity; the heart and kidneys might be classed together owing to their shape and their firmness of consistence; the lungs might be classed with the liver if

examined in a man who had died of pneumonia ; the brain and spinal cord might be classed together owing to their resemblance to cheese. Nothing like a scientific classification could be attempted.

When systematic study replaced the reign of chaos by a reign of order, and the microscope enabled the anatomist to ascertain the minute structure of the various tissues, resemblances were perceived where none had before been suspected to exist, and an attempt was made to classify the constituents of the body according as they appeared homogeneous, or cellular, or fibrous, or fibro-cellular, or presented some other supposed peculiarity under the microscope. At length the great discovery was made that every part of the body is made up of modifications or developments of a single structural element—the cell. Thus the anatomist finished his work as a scientific investigator by reducing all his phenomena to one. He found it impossible to discover any logical principle of division, and declared the body to be one in structure.

The physiologist progressed steadily in the wake of the anatomist. At first he could distinguish no relations between the functions of the various organs, and could not even discover the functions. He had some notion of the function of the stomach as a bag for holding nutriment, and for producing peculiar changes in it; he guessed that the liver somehow produces bile for some purpose; he saw that the lungs act like a pair of bellows for some reason, and that the heart never wearies in imparting jerks to the blood. He could see no fundamental function.

As the accumulation of truths increased, attempts were naturally made to classify the constituent parts of the body according to their functions; and in the present day physiologists speak of the nervous system, the muscular system, the digestive system, the glandular system, the vascular system, the respiratory system, the reproductive system, and the miscellaneous items which cannot properly be included in any of the systems. No logical principle of division is

adopted by physiologists, and in the arrangement of their systems there is no logical system. They cannot say whether there are ten primary functions or five, or only one.

No division can be final or satisfactory which is not scientific; and there are well-known tests by which the scientific nature of any division must be judged. The first consideration is that the division must be founded on one definite principle capable of providing distinguishing differences, so that there may be no cross-division, or no overlapping of boundaries. If a farmer were to divide his cattle into the black, the white, and the unruly, he would be adopting colour as one principle of division, and conduct as another, at the same time; so that the unruly class might include black or white cattle, and the black or the white class might include the unruly. The boundaries would overlap, and no animal could be certain of its name, supposing it to be scientifically named. The owner could never be certain of the number of his cattle,

or where to find them, if he classed them illogically. The second essential consideration in making a scientific division is that all the parts taken together must be exactly equal to the whole. If a farmer certified that his cattle were white, speckled, and red, he could have no claim to black cattle; and in a scientific division of cattle according to colour there must be no possibility of any animal being compelled to stand outside and look in vain for accommodation. A division is scientifically false when some portions are left which cannot be included within any of the boundaries. Blunders cannot be excused under the heading of miscellaneous items.

What principle of division can be adopted in the case of the body? No scientific division of the body can be founded on differences of substance or of structure, for every part is built up of little masses of protoplasm variously modified and arranged, and all derived from the same original cell or microscopic mass of protoplasm. The mere anatomist must say that it is

impossible to make any scientific division whatever, owing to the impossibility of finding any definite dividing-line between one tissue or organ and another. How can a scientific division be made when all the body is developed from the same protoplasmic cell, in which it is impossible to discover individual parts; when all the tissues are composed essentially of similar cells, in which we can by no means isolate distinct organised factors; when all the cells are nourished by the same blood, which is the fundamental basis of all the tissues? The anatomist must declare that the body is one and indivisible in substance.

At first sight it might be supposed that there is a fundamental structural difference between bone and muscle; but a little more knowledge and reflection will reveal the fact that they are both composed essentially of similar little masses of protoplasm. Bone may be regarded as modified cartilage; cartilage as modified ligament; ligament as modified tendon; tendon as degenerated

muscle. There is no definite and invariable property possessed by bone which may not at some time and in some degree be shared by muscle.

The difference in structure between the bones and the liver seems very definite, and the superficial observer would say that the difference between them must be regarded as fundamental and invariable. The collection of soft cells composing the liver seems to have very little resemblance to bone; and yet bone is only a collection of similar soft cells specially modified and arranged, supported by a framework of lime salts. The blood containing lime flows to all the tissues, and offers them whatever food they require for their work. The cells of the liver can perform their work without the protection and assistance of a rigid covering, and accordingly they decline the atoms of lime presented to them. The cells of the bones have duties which can only be performed by hard unyielding material capable of forming such an instrument as a

lever, and therefore they accept and utilise the lime. The cells in the centre of the leg are called upon to support the body, and to do so they accumulate building material and construct a rigid column. Young bones which have never been called upon to support any weight are not hard, and possess very little lime; while liver that has been compelled to struggle against alcohol for many years may become as dense and firm as foetal bone. A disease like cancer can very quickly convert the hardest bone into a shapeless mass of soft cells with much more resemblance to normal liver than to normal bone.

The body does not contain any parts which present any distinctive and invariable differences in consistency, or colour, or shape. Such a term as hardness can only be employed in a relative sense: the bone which is hard in the man is comparatively soft in the infant, and every tissue is liable to vary in consistency according to the state of the health. No portion of the body has any

definite colour. The bones are commonly supposed to be white, but they are white only when dead and bleached. The bluest eye may become dark and muddy in appearance when the liver and the moral nature are diseased. There is no part of the body possessed of definite shape. No part can be correctly described as spherical, or cubical, or circular, or square, or triangular.

Chemical composition might be expected to furnish the means of distinguishing the parts or organs of the body from one another; but there is no tissue composed exclusively of elements or compounds not found in any other tissue, and there is no element or compound entering into the composition of any tissue which may not be detected at some time in some other tissues. Nothing can exist as a normal constituent of any tissue which has not previously existed in the blood, at least potentially.

Difference of function is the only ground on which a scientific division of the body can be based; but at first sight it would appear

that by adopting peculiarity of function as the principle of division we open the way to an indefinite number of distinct parts. Every large organ seems to have a distinct function, and every little gland, and even every individual cell, may be engaged in the performance of a special function. A little reflection on ascertained facts soon diminishes the number of apparently distinct functional elements, until, as one straggler after another is brought within the circle, we may almost hope to reduce all within the compass of one law of unity, and may doubt whether any scientific division whatever is possible, even with difference of function as the basis of division. In our ignorance we may protest that any attempt at division is unscientific and absurd.

If we assume that the heart is worthy of a place by itself, or of a special division, owing to its function of propelling the blood, we are at once met by the objection that the arteries, the veins, the lungs, and even the voluntary muscles, are more or less engaged

in performing the same function. If we try to separate the lungs as the organs engaged in oxidising the blood, we are at once informed by the physiologist that the lungs are only modified pouches of the skin, and that the skin assists in oxidising the blood, and must therefore be placed in the same division as the lungs.

The liver seems clearly defined as a separate and distinct organ, and yet when we try to discover how it differs functionally from all other organs we find the task impossible. We may say that the distinctive function of the liver is to produce bile, but such a statement has no definite meaning. Bile is not a definite compound, for it varies in composition, colour, and consistency. The cells of the liver appear to separate the constituents of bile from blood, but the cells of other glands have the same power. Water is the principal constituent of bile, and the cells of the kidneys separate water from the blood more extensively than those of the liver. There are salts of soda and potash in the

bile, and the kidneys can separate such salts from the blood. We may say that the liver forms glycogen, or that it removes glycogen from the blood, or that it is the organ which forms bile and glycogen; but we cannot define what constitutes either bile or glycogen. We know the composition of alcohol, and if any organ had the exclusive power of forming alcohol, that organ would be a distinct functional element. Bile may be regarded as a collection of refuse of variable composition, and glycogen as a mere temporary and indefinite state of food undergoing processes of metabolism. There is no essential difference between the function of the liver and the function of every glandular cell in the body.

Muscles seem to differ essentially in function from all other tissues in the body. Muscles such as the biceps or the heart do not seem to have any resemblance in function to liver; but as the student proceeds in the analysis of functions he will find resemblances where he did not expect them, and many apparent boundaries will disappear.

A muscle is only a collection of cells or particles of protoplasm possessed of inherent power of contracting so as to alter their shape. The contracting cells are enveloped in an unyielding sheath which conserves the power exerted when the muscle is fixed in position. A muscle like the biceps is fixed at both ends, so that when its component cells contract the fixed points tend to approach one another. The heart is a collection of muscular fibres arranged more or less concentrically around a cavity, so that when they contract the volume of the cavity is diminished and the blood which has flowed into it is expelled. Cilia, such as those which line the air passages, are particles of contractile protoplasm fixed only at one end, so that their efforts at contraction produce a lashing or fanning motion. Every cell of a muscle, and every cell of the liver, and even every cell of the blood, is a particle of protoplasm possessed of inherent power of contraction, but some are fixed in one way and some in another, while some are left free.

The eye seems to perform a function which is not performed in any degree by any other tissue or organ ; and if so, it must be described as a distinct functional element. Before we say that the eye is a distinct functional element of the body, differing from all other parts by possessing the power of seeing, we must consider what we mean by the eye, and what we mean by seeing.

The eyebrows, the eyelids, and the bones of the orbit are not portions of the eye, though they are occasionally useful and necessary. Fishes do not require eyelids, and insects sometimes have their eyes projected on stalks instead of having them deeply seated in sockets. The strong fibrous sclerotic coat of the eyeball is merely a convenient case for the protection of the organ, and we might suppose it replaced by a case of leather or other material if we could only make provision for a few blood-vessels and nerves. The cornea allows the rays of light to enter the eye, and slightly alters the direction of some of them, but it has little more

to do with the function of seeing than a pair of spectacles would have. The vitreous humour seems to be an essential portion of the eye, and yet, so far as mere vision is concerned, it might be entirely absent, or it might be replaced by a little watery fluid. The crystalline lens seems very important to the organ of sight, and if it escaped from the eyeball through a wound an ignorant person on seeing it might say that the *eye* had fallen out; yet in cases of cataract the lens must be removed altogether in order to enable the individual to see.

What is the eye, or what is the part essential to the function of seeing? It is the retina, which is simply the termination of a nerve specially spread out and arranged to receive and discriminate vibrations of ether. The eye is only a specially impressible portion of the surface of the body, provided with necessary protection, and with facilities for the efficient performance of its function. Seeing is only a variety of feeling.

In like manner we find that the essential portion of the organ of hearing is the termination of a nerve arranged so as to receive and discriminate vibrations of air; and the ear may be described as a specially impressible portion of the surface of the body, while hearing must be regarded as a variety of feeling.

The whole surface of the body must be regarded as the organ of the sense of touch, and the special senses are only modifications of the sense of touch. Now, touch is the perception of forms of motion. Without movement there can be no sensation of any kind. The special senses are special tactile organs, in which the nerves are developed and arranged to feel and discriminate special modes of motion. The eye is impressible to vibrations of ether, and the ear to vibrations of air. The lining membrane of portions of the nostrils is furnished with means of detecting the presence of odoriferous particles or gases; and this little portion of the surface of the

body, with its appropriate machinery and internal connections, is described as the organ of smell. Portions of the surface of the tongue and neighbouring parts are modified so as to feel the contact of particles capable of producing the sensation of taste, and thus we speak of the organ of taste.

Movement and moisture are essential conditions of sensation. Man can know nothing without motion, and can know nothing without water. The eye and ear must be moist in order to transmit the vibrations of ether and air. The most powerful odours, and the most delicious viands will be unrecognised if the lining membrane of the nose and mouth is dry. The skin that is callous and dry has lost its peculiar function. The greatest teachers will lecture in vain to the man who is making no effort to learn, or whose mind is not moistened with knowledge so that he may appreciate truth.

Man possesses no knowledge except as the result of sensation, or of the exercise of the

sense of touch. He must come in contact with the world in order to know it. Every portion of the whole surface of the body, internal as well as external, is in some degree the organ of touch, but some parts have the nerves specially arranged and developed. The palms of the hands and the soles of the feet are the parts of the body farthest from the brain, and therefore they have the sense of touch specially developed, in order to be able to give timely notice of the conditions of the physical environment; since it is always well to keep an enemy at arm's-length.

The special senses may seem totally distinct from one another, and from the sense of touch. When the eyes of bats are entirely destroyed they can still fly with great swiftness through intricate passages without coming into collision with threads and other obstacles purposely placed in their way, and it has been suggested that they may possess some power of seeing with their wings or ears. The prophet Ezekiel saw

the human body illuminated so that every cell in it appeared to be an eye. Blind men have often some delicacy or peculiarity of sense which others cannot understand. A man is supposed to hear only with his ears, but when the brain is healthy the ears may be stopped, and yet the vibrations of a tuning-fork will be heard very well if it is applied to the skull or to the teeth. If the bones of the fingers were continuous with those of the skull we might possibly hear the sound of a tuning-fork with our fingers; and if the optic nerves gave off branches to the hands and feet we might have an eye at the end of every finger and toe. There is no scientific line of division between any two organs of special sense, or between any organ of special sense and the skin as the great organ of common sensibility.

Progress in science is impossible without classification of some kind; and certainty of knowledge can never result from generalisations which are based on artificial and arbitrary classification. The divisions of the

body at present employed by physiologists are not logical divisions; and therefore students find the variety of text-books extremely confusing, and no definite information given in them regarding the factors which make up the normal man. Those who are the highest authorities regarding the working of the machinery have never defined what are the primary parts of it. Brain and nerve are classed together as forming the nervous system, though the special function of brain is to think; and no physiologist teaches that nerve can think. Thus two elements which are functionally distinct are classed together. If it is said that brain and nerve are classed together owing to their physical resemblance, then there is abandonment of the principle of division, which must be according to function.

The digestive system is at present given as a separate division, though no one can define what is necessary to constitute a digestive organ. If an organ is classed as digestive because of its property of producing

chemical transformations in some of the constituents of the food, then all glands, and probably even muscles, must be described as digestive organs, since they produce chemical transformations in some of the constituents of the food. The glandular system is given a place as a primary division of the body, though all glands may be described as digestive organs, and all digestive organs are glandular. The vascular system is described as a primary division distinct from the muscular system; but if this is done because the vessels are all more or less tubular then the division is not according to function; while, if we consider the blood-vessels from a functional point of view, we find that they perform their special function to some extent by means of the muscular tissue in their walls. No one can tell under what heading the spleen is to be placed; whether it is to be reckoned a digestive organ, or a vascular organ, or a glandular organ.

The respiratory system is described as the division of the body which has for its

function the oxidation and purification of the blood; but the skin is also a very important organ for oxidising and purifying the blood, and all glands perform the same function in some degree, so that they must be described as respiratory organs. Thus there is absence of clear vision and of logical arrangement, with the inevitable result of endless confusion due to cross-division. How can we understand the working of a machine, or the relations of its parts to one another, or the means of adjusting the parts when they are not working in harmony, if we have not a clear idea of the primary parts of which it is composed?

The first question that ought to occupy the mind of the student of physiology is, what are the primary functions, and the functional elements of the body? We cannot learn the functions of the body merely by the microscopic examination of the tissues, or by the study of the ovum. We might as well try to learn the use of a building by counting the number of the stones employed in the

construction of its walls and by analysing the mortar. The body must first be studied as far as possible in its perfect or archetypal state ; and then important information may be gained by the study of its microscopical structure and chemical constitution. The appearance and properties of a tree are not learned by the examination of its seed, or the use of a medicine by the analysis of the material composing it ; and the man who concentrates his attention upon the ovum, or the cell, or the fibril, or the material in any form, can never know the ideas in the Creative Mind.

It will be found that there are three primary functions of the body, or that there are three functional elements ; and that these three functional elements, though one and indivisible in substance, are yet separate and distinct in function. The three functional elements are Brain, Nerve, and Working Protoplasm ; their distinguishing functions are to think, to feel, and to move matter ; and this is not only a scientific division of the body but is the only possible scientific division.

CHAPTER III.

BRAIN AND NERVE.

IF any part or tissue of the body performs a function which is not performed in any degree by any other part or tissue, then the part or tissue performing the special function is a functional element of the body. Brain alone is the organ of thought, and therefore brain is a functional element of the body.

There is practically no need in the present day to spend much time in proving that brain alone can know and think. It is almost an elementary fact in physiology. The arms, the legs, and other portions of the body are often cut off or destroyed, and no one expects such operations or injuries to affect the thinking power of the individual so long as the brain is healthy. The savage may say that he talks in his stomach when he meditates,

and may think that his liver is the seat of consciousness; but the English schoolboy does not mistake the function of the stomach, and has no doubt what is meant when told to use his brain. No portion of the body except the brain can be supposed to think; and all power of thought vanishes when the brain is seriously injured, or when its function is arrested by drugs.

Cases not unfrequently occur in which almost all sensation and voluntary movement are destroyed by accident or disease, and yet the intellect remains unaffected. Thus a patient had both legs paralysed so that he could not stand; both arms paralysed so that he could not lift his hands off the bed, and could only slightly move his fingers; when placed in a sitting posture he could not retain it, but toppled over; his eyelids were paralysed and wasted so that he could not make the slightest effort to open his eyes; all the muscles of the eyeball were paralysed except the external recti, so that when the eyelids were opened for him the eyes stared fixedly,

except when an effort caused one eye to rotate slightly outward; one side of his face was paralysed, and quite immovable by any attempt to laugh or make grimaces; and yet this man could hear well, could see when any one opened his eyes for him, and he laughed and talked so that any one in an adjoining apartment conversing with him or listening to him might have believed him to be in very good health. So long as the brain itself remained unaffected, the power to know and think remained unaffected.

There is nothing whatever that we can imagine to be similar to thought. Brain appears to be only a collection of the cells and fibres which form nerves, and yet no nerve has the slightest power to think. Brain performs a function which is not shared in any degree by any other part or tissue of the body, although we can neither define the boundaries of the brain, nor define the boundaries between thinking, dreaming, feeling, and unconsciousness.

Nerves constitute the organ of feeling, and

no part or tissue of the body except nerve possesses in any degree the power of feeling, so that nerves form a functional element of the body.

No portion of the body possesses any sensibility except in so far as it is endowed with nerves. Any part may be burnt to a cinder without the knowledge of the individual if its nerves are first severed. An organ such as the liver, which possesses few nerves, may be very much injured by violence or disease without the production of any pain. Many people die from inflammation and abscess of the liver, or spleen, or kidneys, without ever suffering any pain comparable to that produced by an ordinary whitloe or by a scald of the foot. Fat possesses very few nerves; and when a mass of fat is exposed by a wound of the skin in a fat person it possesses very little sensibility to injuries inflicted upon it until nerves form on its surface as a result of inflammation. The palms of the hands and the soles of the feet have a better supply of nerves than the

shoulders, and therefore they have greater sensibility. The exposed surface of the eye has a very delicate nervous supply, and corresponding delicacy of feeling.

The functional distinction between brain and nerve is truly scientific. Brain does not share the function of nerve, and nerve does not share the function of brain. To the ignorant it seems incredible that brain can be devoid of feeling, and yet such is the fact. Brain substance may be torn, or burnt, or otherwise injured, without the production of any pain, or of any sensation whatever. In a case of apoplexy the blood escaping from a ruptured vessel may tear its way through the substance of the brain, and yet the individual may remain quite unconscious of the injury, and may consider himself to be in very good health and very comfortable, with the exception, perhaps, of a slight feeling of weariness or stupidity. Brain alone can know or perceive the sensations felt by nerve, yet brain can feel no sensation in itself. When any injury to the brain is felt it is

because some of the nerves supplying the membranes of the brain have been injured.

We cannot define what we mean by thought, nor what we mean by feeling. When nerves discriminate sensations such as heat, or cold, or tickling, or any movement, we say that they are performing their function of feeling; yet we know very well that the sensation must become a perception by means of the brain before it can be recognised as a sensation. If we define feeling as discrimination of sensations, then we shut out half the nerves of the body from the other half in our attempted scientific division; for the motor nerves cannot properly be said to distinguish sensations, or to convey sensations to the brain. As a matter of fact, philosophers almost instinctively use the term "feeling" in a wider sense than to express the distinguishing of sensations.

Sensations result from movements, either of an organism or of its physical environment, and the afferent nerves feel these movements and convey the impressions of them to the

brain. Thus, afferent nerves are nerves of sensation, and inform the brain of modes of motion. But we speak of feeling love, or of feeling hate, or of feeling a desire to yawn ; and in such cases the nervous current or force, or whatever it may be, passes from the centre outwards along the efferent or motor nerves. Under artificial conditions, such as hypocrisy or conventional politeness, the flow of currents of love, and hate, and other emotions is prevented from manifesting itself, and may not be recognised ; but under natural conditions every feeling causes a flow of nervous influence from the brain along the motor nerves to the surface, and there manifests itself, as in blushing, or in altered expression of the countenance, or in sensations referred to the skin, or in active muscular movements, as in fighting.

Feeling must include the discriminating of sensations and the conveying of them from the surface to the brain, but also must include the discriminating of emotions and the conveying of them from the brain to the

surface. It is brain alone that is supreme, or that knows, thinks, feels, and wills; but though the brain directs a muscle to move, and gives it the power to move, we say that it is the function of the muscle to move; and though the brain feels all sensations and all emotions, we say that it is the function of the nerves to feel and convey sensations and emotions.

Brain alone is conscious of feeling; and it is impossible to separate feeling from the recognition of it, though we must separate sensations from perceptions. We are compelled to attempt the impossible, and in the name of science we say that we know what we mean. Every feeling is a compound of sensation and perception, the sensation being the peripheral element and the perception the central element. When a fly is crawling upon the hand, the sensation it produces has no reality until it is perceived by the brain and so becomes a perception.

Sometimes the sensation element of the feeling predominates, and sometimes the

perception element predominates. In the case of the perception of the motion of a fly on the skin, the feeling may be almost entirely objective, and then we think only of the function of the peripheral terminations of the nerves. When a very pleasing object produces a strong effect upon the eye, the resulting sensation may affect very strongly the perceptive centres, or the central terminations of the nerves; and then the resulting feeling may have the emotional element so predominant that strong currents may pass outwards in the motor nerves. Thus, desire of any kind is the result of sensation which has strongly affected the central termination of the nerves. In the case of love, the central feelings of the nerves are powerfully impressed by pleasing sensations, and may be permanently modified; so that sensations of the most diverse character may recall the pleasing image, or may cause the harmonious vibrations to be repeated.

Feeling is manifested in two ways: either by revealing to consciousness the sensations

produced by some mode of motion, or by causing the contraction of some particle of protoplasm. Sensory nerves in feeling announce impressions to the consciousness; motor nerves announce impressions to the muscles, or to some other part of the organism. When any movement takes place in the body we may infer that some motor nerve is announcing its feeling of some impression.

No nerve-fibre can be injured in the slightest degree without proving that it possesses the function of feeling; for either consciousness will be informed of the injury by a sensory nerve which declares that it is pained, or some muscular fibres will be made to contract by a motor nerve, which thus proclaims that it feels. Brain substance may be injured or destroyed without any notification being conveyed to the consciousness, and without the production of any contraction of any muscle or other structure. Brain thus differs from both sensory and motor nerves.

The spinal cord and the trunks of nerves may appear neither to think nor feel, and therefore to be incapable of inclusion in a division of the nervous system into that which thinks and that which feels; but any injury of them is always announced, either to consciousness directly as pain, or by the production or affection of muscular movements. In many cases the consciousness does not need to be informed of the impressions that are being felt by the nerves, and the brain has no time to think of every little sensation. There must be some arrangement to save the brain the trouble and worry of attending to the announcement of every trifling movement, and therefore subordinate nervous centres are provided, which are empowered to receive messages of little importance and to give the appropriate responses to them. When a man wishes to study he leaves his spinal cord to attend to affairs of digestion and respiration, and to direct movements which are described as automatic. When the brain itself does not

interfere the impressions are said to be unfelt, though they are in reality received and responded to.

When a healthy man is asleep the function of the brain is suspended, while the nerves are left to take care of the body. The processes of circulation and respiration are carried on as if automatically, and the sleeper shrinks from any source of irritation, and even turns over to avoid it, without the brain being called upon to exercise its function of thinking. It may be said that there is subconscious thought when the sleeper withdraws from a source of irritation without awaking, but subconscious thought may be compared to the region between light and heat which science must ignore.

The somnambulist has his brain and nerves functionally separated to an unhealthy degree, so that the nerves are not satisfied with the limits of authority assigned to them but attempt to take command of the voluntary muscles and to walk away with the body when the brain has temporarily laid aside its

supreme control. Thought is required for the control and guidance of the voluntary muscles; and though the nerves can repeat by reflex action many of the lessons they have been taught, they cannot think and judge for themselves so as to foresee consequences. Hence the somnambulist will walk unconcernedly over a precipice if it lies in a path which he has never traversed before under the guidance of his brain. Emotion trusted to govern destroys kingdoms; and a man who acts as leader will take his followers over a precipice when passion gains supremacy.

In hysterical conditions we meet with many examples of the functional separation of brain and nerve; and in fact the characteristic symptoms of hysteria depend on derangement of the relations of these two functional elements. In some cases the brain refuses to think while the sensibility of the surface endings of the afferent or sensitive nerves is greatly increased; and then we have a state of hyperæsthesia in which the individual

experiences sensations of burning, cutting, stabbing, itching, or intense pain, without any adequate objective cause.

In other cases of hysteria the thinking function of the brain is suspended while the functional activity of the nerves is morbidly increased at their brain terminations; and in consequence of this condition excessive and uncontrolled currents of emotion flow down the efferent or motor nerves, so that the individual weeps passionately without grief and laughs boisterously without mirth. This may be described as hyperæsthesia of the central nerve-ends, in contradistinction to the ordinary hyperæsthesia which affects the skin, or the peripheral nerve-end. When the central hyperæsthesia, or over-activity of the emotional centres, is allowed to manifest itself without control there is said to be a nerve-storm; and such a storm may sometimes be cut short by a copious downpour of cold water coming suddenly and unexpectedly upon the skin. The shock of a cold douche applied rudely and unfeelingly arouses the

brain centres and the person to the fact that she is not in harmony with the environment, or that the emotions of those around her are not sympathetic; and so the brain is compelled to resume its function by striving to think of some means of escape to more favourable surroundings.

Sometimes the brain in hysteria appears to retain its function when the peripheral terminations of the nerves have their function suspended; and the individual then presents the phenomena of anæsthesia, in which the skin may be pinched or injured without the production of pain, though the individual is conscious of what is being done. In these cases the sudden apprehension of danger may rouse all the functions of the body into a state of activity by emotional excitement; and the sufferer from hysterical paralysis may become able to run if a genuine, or apparently genuine, alarm of fire is raised.

Sometimes the brain retains its function while the central nerve-endings are functionless; and then there is consciousness of all

that is passing around, but a state of indifference to circumstances which would normally evoke manifestations of strong emotion: a woman being then quite apathetic even when her children are appealing for notice.

Insanity always depends primarily upon some impairment of the control of the spirit over the elements of the mind; but many of its phenomena depend upon derangement of the connections between the functional elements of the body. The brain may perform its function without any apparent diminution of ability to think and reason on many subjects, yet the lunatic capable of exposing a fallacy may fancy that his body is not his own, and may tear out his eyes or mutilate his body with complete indifference to pain, and perhaps with a positive feeling of pleasure. The normal connection between brain and nerve is dislocated; and though the brain still retains its function of thinking with former ideas, the nerves have lost the power of discriminating causes of sensation, and of conveying accurate information to the

brain ; while the brain is also impaired at its junction with nerve, so that it cannot correct false perceptions, or select the healthy portions of the perceptions for conversion into thoughts. The brain of a lunatic is often deranged in function while the nerves are in an ordinary healthy state ; and so we find the active, healthy-looking man the victim of delusions regarding his own condition, or the conduct of friends, or the identity of relatives, or some other simple matter on which he is utterly unable to form a correct judgment.

In the artificially-induced temporary insanity of mesmerism the functional connections of brain and nerve seem to be at the mercy of the operator ; so that the brain of the victim will pursue any train of thought suggested by the victimiser, without any regard to the warnings and remonstrances of the nerves or to the condition of the surroundings. The functional elements can be disconnected or impaired at the whim of the operator because the spirit has surrendered the control which unites all into one intelligent

organism. While the whole body is to all appearances in its healthy condition the brain may be deprived of its power of thinking, so that the individual may believe himself to be in a desert, or in a balloon, or at sea, while he is standing on a platform confronted by a laughing, or disgusted, audience; or he may even lose his consciousness of personal identity and believe himself to be some one else. A mesmerised farmer may believe that he is an opera singer, or a ballet dancer; yet, while his brain is thus deprived of its function of thinking and judging, his nerves may still guide him in all his movements and enable him to distinguish sensations, so far as suggestions acting upon his brain do not interfere.

The union of the elements is so complete that there can never be absolute extinction of any element without the death of all; and yet mesmerism may deprive the nerves of the power of distinguishing sensations while the brain is apparently in possession of its function of thinking. A man who has his

functional elements temporarily dislocated by mesmerism may seem to be in full possession of his intellectual powers, and to be of sound mind, but on being suddenly told by the mesmerist that the seat he is on is red hot he will bound from it with a yell of pain, and will believe himself to be suffering great pain and injury until assured that it is a mistake. His nerves become functionless, or rather become depraved in function, so that he is in pain, or is tickled, or is deprived of sensibility, at the mere suggestion of another; and consequently he will drink castor oil with delight when told that it is wine, and will permit pins to be thrust into his flesh without receiving any intelligence from his nerves of the injury to his body. That the nerves do not really feel in such cases is proved by the absence of twitching or reflex movement as the result of irritation; a straw inserted to tickle the nostril or the ear being tolerated without flinching.

Drugs are generally very complex in composition and in action, but there is always a

preference shown for some particular organ or tissue, and in some cases one functional element is specially affected. Alcohol in some forms given to a healthy man in small doses increases or stimulates the function of the brain while weakening the function of the nerves ; and this increase of function seems to depend not so much on the alcohol as on something intangible in the flavouring substances or essences it contains. The stimulated individual has quicker perception of ideas, more brilliancy of imagination, readier wit, and increased fluency of speech ; yet the function of his nerves to distinguish the state of the environment is rather diminished in activity and power. The orator under the influence of a stimulant may display superior mental capacity, while he may be insensible to causes of physical discomfort which would not be tolerated when he is free from the influence of the stimulant.

While the function of the nerves at their peripheral extremities is somewhat deadened,

so that there is comparative insensibility to external impressions, the central terminations may have their function rather exalted by the excited state of the contiguous brain; and hence the currents of emotion flow more freely into outbursts of generous sentiment and impassioned sympathy in after-dinner speeches. Some stimulants appear to have a specially irritating effect upon the brain at its junction with the nerves, and violent passions of an evil nature are perhaps liable to be thus produced by whisky which has not been sufficiently purified and matured so as to free it from poisonous substances like fusel - oil. Sunstroke, by congesting the superficial cells of the brain, leaves them peculiarly susceptible to the action of alcohol.

Strychnine acts chiefly upon the nerves at their central endings in the spinal cord, and leaves the brain unaffected unless secondarily. Thus a person poisoned by strychnine has the function of the nerves intensely stimulated, especially the motor centres in the

spinal cord ; and consequently the slightest irritation of the skin, such as the falling of a straw or the blowing of a current of air upon it, may be sufficient to throw the whole body into violent convulsions. The agony of strychnine poisoning depends upon the immunity of the brain from its action ; for the individual remains perfectly conscious of his condition, and awaits with intense terror each attack of convulsions, in which he is compelled to see his body twisted and distorted with the utmost violence while he is unable to exercise the slightest control over it, until with blackening face, and bursting eyeballs, and horror-stricken countenance, he gasps for air as he watches himself being strangled by his own nerves and muscles.

Cocaine suspends the function of the nerves when locally applied, and so prevents pain. The nerves supplying a mucous surface, such as the surface of the tongue or of the eye, cease to feel when a solution of a salt of cocaine has been applied to it for a few

minutes ; and thus a person who would be in misery at the prospect of an operation for the removal of an impacted particle of metal or cinder from his conjunctiva is able to allow the surface of his eye to be cut or scraped, while discussing calmly the value of anæsthetics.

Besides its great interest as an account of the triumph of an individual over his body, or of the spiritual over the material, the description of the death of Socrates is extremely interesting as an account of the action of a poison in discriminating between brain and nerve. After the philosopher had drunk the hemlock draught he continued to walk about until his legs felt numb and stiff, when he lay down, as commanded, and submitted to the bandaging of the numb extremities ; while he calmly made observations on the progress of the numbness and the action of the poison. As sensibility was being extinguished in his legs he felt himself with his hand, to try how much of the surface sensibility of the legs and body remained ; and as the numbness and

loss of feeling extended to his body he remarked to his friends that when the cold reached the heart he should depart from them. Thus the function of the brain as the organ of the intellect remained unimpaired until the function of the nerves had been sufficiently destroyed to arrest the action of the heart and lungs, and so to deprive the brain of the supply of oxygenated blood upon which all the functional elements depend for their existence.

It is impossible to define where one tissue ends and another begins, yet physiologists do not hesitate to affirm that brain is brain and that nerve is nerve. The gradual merging of structures and functions is the uniform practice of Nature, since life would be too monotonous if there were no trackless forest or mountain or unexplored region. It is only brutes and idiots that can be content without some mysterious borderland to explore.

Brain and nerve are connected by a quantity of intermediate nervous material in which functions are so intermingled as to be

inexplicable; and yet all the nervous material between that which thinks and that which feels may be theoretically eliminated. A man can be intelligent and sensible when the distance from his brain to his feet necessitates the employment of six feet of nerve tubing to make the connection; but a man may be equally intelligent and sensible when only five feet of connecting material is required, or when four feet is sufficient. So far as thought and sensation alone are concerned, we may suppose the surface to approximate more and more closely to the centre until the spinal cord and nerve trunks vanish altogether, and the man becomes a hollow sphere with consciousness located on its inner surface and sensation on the outer.

When the scientific student is informed that brain and nerve are distinct functional elements of the body he naturally demands a definite statement as to what he is to regard as brain and what as nerve. He asks for accurate definition, and says that science cannot accept as fundamental truths any but

clearly ascertained facts. It seems quite unscientific to attempt to study the relations of things, while at the same time confessing that it is impossible to discover where one ends and another begins.

The difficulty is not simplified by the study of the functions which provide the basis of division. The function of brain is to think, and the function of nerve is to feel; but how are we to define accurately the distinction between the functions? Where does thinking end and feeling begin? How can we think without feeling, or how can we feel without thinking? The student is invited to discuss the incomprehensible, and this seems contrary to all our notions of science; for we are accustomed to talk as if comprehending entirely the phenomena which we discuss, and we are often very positive and dogmatic in our definitions, though others may fail to understand the precise meaning of our words. Do we know where heat ends and light begins? It is pleasant to fancy that we know something thoroughly when we have learned that

a muscle can be made to contract by the irritation of a nerve, or when we have learned that strychnine causes the spinal cord to cause spasms of the muscles; but how the muscle contracts, or why it contracts, or how strychnine can have such effect on the spinal cord, or the spinal cord upon the muscles, we do not stop to consider. We pretend that it is all comprehensible, and content ourselves with the manufacture of more words.

The believer in evolution has an objection against belief in the possibility of any scientific division of the body, and this objection is to him quite insurmountable. The smallest conceivable particle of protoplasm that can exist as an individual organism is apparently capable of performing in an elementary manner all the functions performed in the human body; and it seems absurd to speak of the functional elements of a microscopic mass of jelly-looking material. The cells of brain, nerve, muscle, and blood all seem to possess in some degree all the properties of the body that can be demonstrated in the

laboratory; and the body seems only a larger and more complicated mass of protoplasm. Since all the body is developed from the cell which produces the blood, and is all nourished by the blood, we cannot help thinking that the blood must in some way possess all the properties manifested by the body. How, then, can we believe in functional elements? Experiments upon the elementary cells and tissues reveal no definite distinctions of function or of structure.

An apparently structureless mass of protoplasm, only visible with the aid of a microscope, seems in some measure to select a place for its abode, and somehow to catch food, which it appropriates and digests. It rejects what is injurious and devours what is wholesome. Does it not think and plan? Does it not feel the particles which it seizes, and between which it discriminates? Does it not exercise some degree of volition in the capture and selection of its food? Can it be supposed in the name of science that three functional elements are needed to perform

work similar to that performed by such a little particle of protoplasm ?

From the standpoint of the evolutionist all protoplasm must be regarded as one and indivisible in nature, whether it is in compact visible masses as animals, or diffused everywhere around us in invisible particles, which are ever moving forward into being out of the invisible Infinite; and all organisms, including man himself, must be regarded as merely more or less highly developed masses of the same protoplasm, which grows spontaneously out of the Unknowable, and, after persisting for a time in the region of Fog, again vanishes into the Night. There is thus nothing but an ever-changing ocean of protoplasm condensing from a mysterious Nothing into the countless myriads of germs that inhabit the air; and then further increasing in bulk by the changes which we speak of as processes of digestion and nutrition, until masses accumulate sufficiently large to form elephants and whales. All vegetables and animals, being only accumulations of the

fluid solid which we for the moment recognise as protoplasm, it would evidently be as reasonable to discuss the relations between the ripples on the surface of a swiftly-flowing river as the relations between the elements of the temporary ever-changing mass of protoplasm which we call the human body. And yet we believe in our individual existence as a definite fact.

Science assumes the existence of individuals, and of definite boundaries. The boundary is believed by faith to exist, though we cannot see it. We confidently assert that a horse is not a vegetable, and take this as a scientific fact, though our evolutionist teacher points out that there is no essential difference between a horse and all other forms of animal life, and that there is not even any essential difference to be demonstrated between the lower forms of animal life and vegetables. Science takes faith for its foundation, when it assumes the existence of the Ideal, and also when it assumes the permanence of the order of Nature.

When asked to point out in what respect a horse differs from all other animals we study in vain his shape, and size, and colour, and habits, and organs, and skeleton. Still we believe that a horse is a distinct animal. The fact is that we believe in the archetypal ideas or forms that existed in the Creative Mind, and all science is founded on such belief. We do not believe in evolution, but use words to conceal ignorance. We cannot see the edges of the separate stones employed in constructing the Temple; yet common sense teaches us that our stupidity and blindness is no ground for asserting that there is no Architect. All the junctions are concealed by the cement; but those who are in the secret of the Architect cannot doubt either the individual limits or the completeness of the plan.

The teaching of the farm must precede the teaching of the laboratory; and we must always remember that the majority of those described as philosophers are artificially educated men engaged in trying to prove

what men under natural conditions know. When wishing to study horses, we do not begin by examining the tissues of an animal with a microscope in order to find out whether it is a horse or a tiger. We know by intuition that God made a horse a horse. The Creator does not leave even animals in doubt as to species; and the only men who ever are in doubt are those who mistake empty words for thoughts, or those who concentrate their attention upon a material particle of the properties of which they can learn practically nothing. The functional difference between brain and nerve cannot be discovered by dissection, with or without the aid of a microscope; for in order to know the functional elements of man, he must be studied as nearly as possible in the archetypal state.

Those who deny that brain is distinct in function from nerve because no distinction can be discovered between a brain-cell and a nerve-cell, and no definite boundary line between the functions, must on the same

principle deny that there is any possible scientific distinction between light and heat. We have no doubt that light is light and heat is heat, and it is impossible to learn the laws of optics without ignoring altogether the relationship between light and heat, and even the very existence of heat; yet there can be no light without heat and no heat without light, so far as the human mind can comprehend. The solar spectrum includes thermal rays, no matter whether the light is in the tropics or at the poles; and the temperature of the spaces in the spectrum increases from the violet to the red extremity until it reaches its maximum beyond the point at which light is visible. A mass of molten metal glares with a light insupportable by the eye, but as the mass cools down it becomes invisible in the dark, and then we say it contains no light; though all that is needed to make it visible is to raise its temperature a little. Where is the boundary between light and heat? The bar of iron that is invisible to one man in the dark may

be visible to another, so that whether it is luminous or not depends on its heat and on the vision of the observer. If a man had the necessary vision, the bar would be always luminous; but the boundary between light and heat is incomprehensible, and the mind is only confused by those who multiply words without knowledge in order to gratify vanity by concealing ignorance. If it is scientific to say that light and heat are distinct, it is equally scientific to say that intellect and emotion are distinct, or that brain and nerve are distinct functional elements of the body.

We know by intuition, and cannot doubt, that light is distinct from heat, and yet we know as an elementary fact of experience that there is somehow an indivisible unity between the distinct phenomena. The open mind cannot doubt the distinction, though we search in vain for a definite boundary. Science is founded on primary intuitions, and believes by faith that there are definite boundaries in the unknown tracks where it

cannot see. The founders of true science always have some glimpses of the definite Ideal; though they are very conscious that they are only peering dimly through a darkened glass at the fringes of the mantle which conceals the archetypal form. Those who merely learn the words of others are unable even to see true shadows.

Nature must provide man with an infinite field for the exercise of his mental faculties; and therefore the relations between light and heat, and between intellect and emotion, and between brain and nerve must always be incomprehensible. The delight of exploring would be impossible if there were no unknown regions, and the world must come to an end when excursionists can visit the poles. There must always be new mysteries to attract the attention, and new solar systems beyond the range of the most powerful telescope; for the Imagination of God must be infinitely beyond the grasp of the imagination of any created being, and the creature can never be allowed to acquire the power of

saying:—"There the Creator was compelled to stop and begin afresh!"

In order to be taught scientific knowledge, the student must begin by accepting incomprehensible dogma. The teacher of physiology must lay down the dogmas that brain thinks, and that nerves feel; and the pupil willing to learn must accept the dogmas by faith in his teachers, though he cannot yet understand the reasons for believing them. After accepting the dogmas, the student learns the phenomena exhibited by each functional element, and the relations of the elements to each other, until at length he becomes able to believe with his understanding. Faith is then lost in knowledge.

We must realise the functional elements as distinct in order to know them; and the more we learn of their nature and relations the more clearly we can realise their existence as functional elements. A very primitive and elementary education is sufficient to enable a man to accept intelligently the dogma that the brain is the organ of

the intellect, and the supreme element of the body; but knowledge of the phenomena exhibited by the body can only be scientific and satisfactory in proportion as we know the functions of the brain in preserving the life and in maintaining the health, and the relations that exist between it and the other elements of the body.

The primary functions of the body cannot be recognised without study; nor by those who do not honestly seek for truth. There is no hope of gaining a true knowledge of the colour of an object if the observer is colour-blind, or if he refuse to dispense with coloured spectacles. The honest inquirer may learn how to improve his vision if he will ponder well the fact that a shepherd can recognise each individual sheep when a stranger cannot tell one from another. So long as we are content to look at the flock of sheep as a mass in which we have no special interest, we cannot hope to perceive the different characteristics which distinguish them; and the examination of

their wool or their blood with a microscope will not help us in the slightest degree. When we regard them with affection as individuals to be cared for, we soon perceive points of resemblance and of difference; and the more we learn of the points of resemblance and of difference the more clearly we recognise them as distinct individuals.

CHAPTER IV.

WORKING PROTOPLASM.

BRAIN is a functional element of the body, distinguished by being the organ of the intellect, or the organ of the element of the mind which thinks. Nerves form a functional element of the body, distinguished by being the organ of the emotion, or of the element of the mind presiding over feeling—the term feeling being here used in its comprehensive signification as including both the central function, usually called emotion, and the peripheral function of sensation. How can all the rest of the body form a single functional element? What function is common to all the body except brain and nerve, and is not shared by either brain or nerve?

The muscles, the heart, the bones, the lungs, the stomach, and the liver do not seem at first

sight to possess a common fundamental function, and yet they are all engaged in performing one definite function which is not performed by either brain or nerve. Their special function is to move matter; and they may all be included under the head of Working Protoplasm, which thus constitutes the third functional element of the body.

Muscle, whether voluntary or involuntary, is evidently working protoplasm; for the most elementary knowledge of physiology is sufficient to convince any one that all muscles have movement of matter as their special function, and in fact it would seem at first sight that muscle is alone in the possession of this function.

The heart is a hollow muscle with its fibres so arranged that the cavity is diminished by each contraction and thus the contained blood is pressed out, while it is prevented from flowing backwards by valves arranged as in a pump.

The special function of bone is to afford points of support to muscles so as to assist

them in producing movement or in preventing it. A firm jointed framework is needed to form a series of levers which can be moved by attached muscles; and the length, strength, form, and order of the lever are determined by the movements to be executed by its aid. The numerous light and short bones of the hand and wrist are arranged to produce the rapid delicate movements which are needed in the multitudinous offices which the hand is required to perform; the bones of the arm between the shoulder and the hand are formed and jointed to produce the movements which the welfare of the body demands from the organs on which the securing of food, and the means of defence, largely depend; the bones of the lower limbs need to be strongly formed for support, and jointed and supplied with muscles so as to maintain the body erect in walking, and yet to provide for various movements of flexion; the ribs are arranged so as to produce by their movement the expansion and contraction of the chest necessary for respiration.

Nature always converts everything to as many uses as possible so as to make the most of the material; and therefore, besides their employment as points of attachment for muscles, and as levers, bones are employed to support weak structures, and to protect parts which would be easily injured by external violence. Hence the brain is enclosed in the hard bony case of the skull; the heart and lungs are shielded by the ribs; the strong bones of the pelvis assist the ribs to protect the soft abdominal organs; and large blood-vessels, such as the large arteries of the arm and leg, are protected by the presence of a strong bone on the aspect most exposed to danger.

The working protoplasm that is employed to give support and protection has even thus the movement of matter as its special function; for passive resistance to movement is the same in essence functionally as the active production of movement, and the maintenance of parts in position against the action of gravity is the potential movement of matter.

Under the influence of gravity the brain is always tending to fall to the ground and the matter of which it is composed is thus always pressing upon its bony case, so that it is virtually moving matter arrested. The bones of the skull, and spine, and legs, are always exerting just as much upward pressure as gravity produces of downward pressure; and thus the force which they are exerting upon matter is not allowed to manifest itself. The engine which is moving a train at the rate of sixty miles an hour is evidently producing movement of matter; but it is no less acting upon matter when it is unable to move the train owing to the steepness of an incline, and is just able by working at full pressure to prevent a backward movement down the incline. All connective tissue is engaged in upholding and supporting the organs and tissues of the body, since all would fall asunder under the influence of gravity if not so supported.

The lungs are popularly supposed to move the air we breathe; but that is not their

special function. The air as a mass is moved in respiration by the muscles with the assistance of the ribs and other bones and connective structures. The true function of the lungs is not to act as mere bellows in the process of respiration, but to produce movement of matter in the form of oxygen, nitrogen, carbonic oxide, and aqueous vapour; and this function is performed by the lining membrane of the lungs. Of course it is of no consequence that the matter upon which the lungs act is invisible; for under sufficient pressure, and with a low enough temperature, all gases become visible as liquids, and are then recognised by the most ignorant as material.

The function of the stomach and liver, and of all digestive and glandular cells, is to tear asunder the material molecules composing the food, and to move the atoms into new positions so as to form new compounds. The salivary glands rearrange the atoms of starch so as to form the more soluble glucose; the cells constituting the essential portion of the stomach

continue the process, and also attack the molecules in the albumen of the food so as to rearrange the atoms into the more easily manipulated peptones; the cells of the liver seize the food as it is presented to them, and gather together, or construct, and throw out the compounds which constitute bile, while they also transform some peptones into glycogen; and each gland continues the process of metabolism by making some alteration in the position of the atoms. Every cell in the body which is not included under the division of brain, or under the division of nerve, will be found to have for its function the movement of matter, either in visible masses or in invisible atoms or molecules, and all may thus be classified as working protoplasm.

The working protoplasm appears to constitute the greater portion of the substance of the body, and it varies in consistency from the soft, semi-fluid, ever-changing cells of the digestive organs, to the hard, solid, immovable bones of the skull. It has to do all the material work of the body in

obedience to brain and nerve. Some masses of working protoplasm direct the eyes to the food ; some seize and prepare the food ; some masticate it ; some swallow it ; some pull asunder the molecules of the starch, albumen and fat, and rearrange their atoms so as to form glucose, glycogen, and other compounds ; some collect atoms and molecules so as to form them into secretions and excretions. Working protoplasm propels the blood ; keeps up a regular blast of oxygen upon it ; removes all impurities and all waste products of metabolism ; and wherever a mass or an atom of matter has to be moved the working protoplasm must move it. Cilia are little masses of working protoplasm fixed at one extremity, so that by their movement they may produce currents in definite directions. Voluntary muscle is the typical example of working protoplasm.

Physiologists will probably admit that the special function of brain is to think, and that no other portion of the substance of the body can think ; they may admit

that the special function of nerve is to feel, and that no other portion of the substance of the body can feel; but they may deny that movement of matter is peculiar to what is here described as working protoplasm. It may be said that nerve and brain perform their functions by moving matter; and if that be true the distinction between the working protoplasm and the other two functional elements is not so clearly marked as a perfect scientific division requires.

Scientific students must always endeavour to distinguish facts from fancies. A man may fancy that when an electric current passes along a telegraph-wire every molecule in the wire is successively decomposed into its constituent atoms and again recomposed; and he may point to the decomposition of water by the current as proof that his fancy is scientifically justified. He forgets that the decomposition occurs when the current cannot pass freely. The movement of the atoms of water may really result from the efforts of the electricity to reduce all bodies

to such a condition that they will interpose no obstacle to the free passage of force. The copper wire, which is a good conductor of the electric current, is not a compound body capable of being decomposed like water; and its efficiency as a conductor depends on its perfect homogeneity and continuity, and its freedom from admixture with substances capable of decomposition. The electric current tends to produce continuity in the conductor; so that when flaws occur in a steel wire or bar a current of sufficient intensity may fuse the metal so as to obliterate the flaw. If we regard nerve-force as merely equal to electricity in subtlety, we are entitled to conclude that it passes best when there is no movement of matter. Nerves are conductors made by the Creator, and must therefore be far more perfect than any copper wire or other conductor which has to be manufactured by man; and if it is unscientific to suppose that a telegraph-wire performs its function by the movement of atoms of matter, it must be still more

unscientific to fancy that there is any movement of matter when nerves are performing their function.

It may be said that we must not assume that there is no movement of matter produced by nerve in the exercise of its function, since there may possibly be some atomic movement which has not been, or cannot be, detected. We must deny what is contrary to reason, experience, or knowledge; and we must never admit as scientifically probable that which has no foundation in observed facts.

Any man may assert that the electric current is a material fluid which rushes with tremendous velocity through open spaces between the atoms of a conducting wire, and it may be impossible to prove that what he says is not true.

Nerves must be in relation at their distal extremity with the modes of motion which they feel, and at their central extremity with the brain. If we assume that the ether, the vibrations of which are felt by the eye, is

material, we may say that nerves must be in relation at their distal extremity with the matter whose movements they feel. Nerves thus may be said to feel and discriminate movements of matter ; yet they do not produce any movement of matter in the exercise of their function.

Sensations may be described as modes of motion felt by nerves. The hand must move in contact with an object, or the object must move in contact with the hand, before any sensation of touch can be felt. Muscles must move before there can be muscular sensation ; air must move before there can be sensation of sound ; molecular movements are needed to produce sensation of heat ; ether must move before there can be sensation of light. The field of nerve-function cannot be strictly defined, since Nature never moves by leaps ; and thus we find the sensation of pressure bringing us into the region of ponderous matter which is immovable, while the sensation of seeing brings us into the region of ether, which is

imponderable, and which vibrates or undulates with inconceivable rapidity.

Sensations vary from sensation of contact or pressure to sensation of light; and yet we can form no idea of the substance of any sensation, or of the manner in which any nerve feels. We may calculate the time which an impression made upon the tail of a whale requires to travel to the brain so as to produce a sensation, and we make the calculation on the supposition that nerve-currents are comparable to currents of electricity; but what we mean by the current, or what we mean by the sensation, we cannot imagine.

Some physiologists have asserted that brain performs its special function by the molecular movement of its constituent cells and fibres; and, having made the unfounded assumption, they proceed to build up words and theories on it as a basis, until they lose sight of the fact that all their teaching is founded on ignorance. The doll is clothed, and decorated, and admired, until the possessor

becomes the victim of the delusion that there is a real child somewhere concealed in the mass of bewildering finery. There is ground for saying that brain produces thought; but it is a groundless fancy that thought is produced by a peculiar series of molecular movements and chemical transformations in the cells of the grey matter of the cerebral cortex. The special function of brain is to convert percepts into thoughts, and that is in no sense movement of matter; though movement of matter must take place before percepts are obtained.

Brain engaged in solving difficult mathematical problems, or in unravelling complex psychological puzzles, requires an extra supply of blood, and utilises some force carried to it by the blood; so that special waste products may be produced by the digestive organs in producing the force. A nerve may be conveying the most pleasurable or the most painful sensation to the brain, and yet the lightest dust upon it will remain unmoved, and no test gives any

reason to suppose that any of its atoms are in motion. Wheat or milk may contain force which brain could transform into a poem ; yet all the combined efforts of brain and nerves cannot liberate the slightest force from a molecule of starch or move one of its atoms.

Physiological chemists have thought of the possibility of distinguishing functional elements by the chemical products of the exercise of their functions, on the supposition that all tissues move matter. Phosphorus has been supposed to be the essential material medium between physical force and thought, or the special food required by brain ; and therefore it has been said, " Ohne Phosphor, kein Gedanke "—without phosphorus, no thought. The brain-cells and fibres are supposed to tear asunder the molecules of compounds containing phosphorus, so as to utilise and convert into thought the peculiar force pent up by the phosphorus atoms.

Matter being absolutely indestructible,

every atom of any kind that acts as food for any organ must be recoverable after the organ has utilised the force it contains, or has made the requisite combinations for developing the potential energy it holds stored up. Phosphorus, as mere matter, enters into the composition of the teeth as well as into the composition of the brain; but in the teeth it seems to be only a passive permanent constituent, whereas in the brain it may be actively employed in functional metabolism, or may be the carrier of special force. It is not unreasonable to suppose that each functional element or special organ requires a special chemical element or compound as the food upon which its activity depends, and that it yields a special chemical substance as the result of its action, or as a waste product. The amount of carbon dioxide exhaled by the lungs is the waste product which reveals the activity of the cells of the lungs in oxidising the blood; the amount of urea in the urine is a waste product which reveals the activity of the kidneys in purifying the

blood of some nitrogenous materials which are of no more use or are injurious; the amount of phosphorus excreted by the kidneys has been supposed to indicate the activity of the brain, and to be the material waste product in the manufacture of thought.

The supposition that atoms of phosphorus are moved in some manner by brain in the exercise of its function has no foundation in fact. The blood going to a gland like the liver can be tested before entering the gland and after it has been acted on by the gland, so that changes in the arrangement of the atoms of the food can be proved to have occurred, and thus the cells can be proved to have for their function the movement of matter; but when the blood going to and that coming from the brain are analysed and compared, no similar chemical differences or rearrangement of atoms can be detected. The liver has a material secretion to show as the result of the work of its cells, but the brain produces no material secretion. We

may say that thought is movement of ether, but when speaking of thought as movement we are only employing empty words to conceal our ignorance. There is no evidence whatever that brain, in the exercise of its function, produces any movement of any atom of matter. Phosphorus may be essential to brain function, and it is possible that such a peculiar chemical element may be employed in carrying some kind of subtle force which brain can utilise without any movement of matter, so that each phosphorus atom may be somewhat analogous to a cell charged with electricity; but electricity may escape or be removed from a cell without movement of matter.

Physiologists may confuse their minds by speaking of the materials with which brain works; for those materials are not material, and it is very material that this should be kept in mind. The nerves do not convey any material secretion to the brain to be elaborated into thought, as material is carried to certain parts of the body to be converted

into muscle, or bone, or hair. Brain has nothing to do with any substance more material than a sensation. Nerves are not to be described as the ducts of a gland. They convey sensations, which are the raw food of the brain. Sensations which are digested become perceptions; and then the brain takes up the perceptions, counts them, compares them, arranges them, and spins them into thoughts.

The qualities of an object impress our nerves of touch, or sight, or hearing, or smell, or taste, and so produce sensations. These sensations may not be perceived, and then they are not recognised to be sensations. When the mind is not paying attention the impression of sensations at the central endings of the nerves is not perceived; yet the sensations may afterwards produce such effects as will prove that they really existed, though never elevated into perceptions. Sensations are modes of motion felt by nerves; perceptions are sensations felt by brain; thoughts are perceptions compared

and classified by brain. Brain depends on nerves for its food, and cannot itself feel any mode of motion. The scratching of a pin on the exposed brain-substance, or the application of a red-hot wire to it, or the concentration of light upon it, can produce no sensation. Nerves must somehow interpret modes of motion as sensation before the brain can know anything of them ; although brain is the central termination of nerves, so that sensation is felt at one extremity of a nerve and perception at the other extremity.

It cannot be denied that sensations are the raw material with which brain works, and it must be admitted that sensations are at least as immaterial as electricity. The action of the cells of the brain may sometimes be compared to that of an apparatus which stores up, or transfers, or modifies electricity ; but such apparatus does not act by producing movement of matter. The matter of which a Leyden jar is composed probably remains unaltered by the electricity

unless the material is somehow imperfect. Brain-function is something incomparably more removed from physical investigation than the function of any electrical apparatus; and if the function has to do only with that which cannot by any effort of imagination be regarded as material, it is absurd to suppose that the work by which perceptions are elaborated into thoughts is an example of the movement of matter. Working protoplasm liberates force from the matter in which it is stored; nerves convey the liberated force to the brain in the form of sensations; brain swallows the sensations so as to convert them into perceptions, and then digests and elaborates them into thoughts.

It is an established physiological fact that when the brain is in a normal condition the grey matter of the cerebral cortex is entirely, or almost entirely, insensible to material stimulation, though when it is inflamed, and thus supplied with nerves, such stimulation may cause

convulsive muscular movements. No muscular movements result from laceration of pure brain; but when the skull is broken, and a jagged fragment of bone causes inflammation, epileptic fits or other convulsive muscular movements may be expected. If we compare the brain-cells to Leyden jars, we may suppose that inflammation forms connections by adventitious nerves between cells which normally act as insulated accumulators, and so explosive or uncontrolled discharges occur. It is evident that brain is normally insensible to movement of matter in masses, as to movement of fragments of bone or of clots of blood which tear its substance; and there is no reason to believe that it is sensible to the molecular movements of matter, such as those manifested as heat and chemical action.

The application of a galvanic or faradaic current of moderate intensity to the cerebral cortex at once produces motor phenomena similar to those produced by the natural action of the brain, or, rather, of the mind.

Electric stimulation of one portion of the surface of the brain of a monkey produces movements of the foot; stimulation of another portion produces movements of the ears; and, as Ferrier and other observers have proved, the same definite motor reactions are uniformly produced by excitation of the same definite areas of the cortex. Electricity is thus proved to be something comparable to sensations, or to the food by means of which the cells of the brain are enabled to perform their special function. But electricity is not material, nor is it the movement of atoms of matter, and there is no mode of motion which is an efficient excitant of the function of brain.

Working protoplasm performs none of its special function except when there is movement of matter. It is evident that muscle is not performing its function when there is no movement, and the cells of a gland are not performing any of their functions when there are no molecular movements or chemical transformations occurring in the

materials upon which they are intended to operate.

Nerves perform their special function efficiently only when there is movement of matter at one extremity and absolute freedom from movement at the other. In order to discriminate the sensation produced by an object upon the skin, there must be movement of the object against the skin, and a restful state of the brain and of the nerve. In order that sounds may be accurately distinguished, the membrana tympani and the chain of ossicles must move freely, while the perceptive auditory centre must be undisturbed by material movement.

Brain performs its special function efficiently in proportion as it is protected from all movement. The greatest mathematician may find it impossible to solve a comparatively easy problem so long as an insect is crawling upon his skin; and the necessity of guarding the brain from movements of matter when it is required to work will be strongly impressed upon any one who will

try to write an original essay on a difficult psychological question while the air is vibrating with the rumbling of vehicles and the slamming of doors, or while several pianos are being exercised methodically by children learning how to move their fingers.

Thus it is proved that though formed from one cell of protoplasm, the body is divisible into three functional parts corresponding to the three elements of which his mind is composed. The intellect is given the brain with which to think; the emotion is given the nerves with which to feel; and the will is given the muscles, and other working protoplasm, with which to move matter. Each portion of the machinery must be kept in good repair, and, when deranged, must be treated according to its nature; and all the parts must be employed in harmony in order that the individual may enjoy health.

CHAPTER V.

ORIGIN OF THE ELEMENTS.

WE know that all the tissues and organs of the body are developed from a microscopic mass of protoplasm only about $\frac{1}{120}$ th of an inch in diameter, and which seems of no more importance than so much jelly or albumen. The process of development is of extreme interest. We are face to face with the most stupendous miracle, and we long to find out how it is performed.

The starting-point of the biologist is the protoplasm, bioplasm, blastema, or germinal matter, of the origin of which he can understand nothing. The puzzle of science is to find the man in the protoplasm. Given a most insignificant particle of jelly, construct a philosopher. Seeing the man as intellect, emotion, and will, nourished and surrounded

by memory, let us watch how he puts on his material clothing.

What is protoplasm? It is the unity of substance from which all living beings are derived. It is living substance—made up of life and substance. What is life? What is substance? Nobody knows; and so science may define protoplasm as the substance in which life is concealed. This is the fundamental axiom of biology. The basis of all life is the union of the inconceivable with the incomprehensible. On this foundation the science of biology is built.

We naturally desire to discover the origin of things, so that we may be able to make them for ourselves. We try to get further and further back, and we can never rest satisfied until we learn how it is all done. We see that there are functional elements in the body, but we cannot see any functional elements of any kind in the original protoplasm; so we want to know in what manner the functional elements at first appeared. Brain, nerve, and muscle are one and

indivisible in the original protoplasm ; and we are anxious to know the earliest period at which they can be distinguished.

All attempts to divide a cell into more elementary parts, so as to study separately the nucleus, the nucleolus, granules, or protoplasmic fluid contained in it, have been without success, and the cell must be regarded as the histological and physiological unit. The impregnated ovum is the cell from which the whole body is developed.

The ovum soon after impregnation is found to have formed itself into a mass of apparently similar cells called embryonal cells. Do these cells first divide themselves into groups destined to form the head, body, and limbs, or to form the bones and muscles, or to form the lungs, liver, and other organs ? Does the division of the cells of the ovum give us any reason for believing that brain, nerve, and working protoplasm are fundamentally distinct ?

The ovum which has been impregnated exhibits peculiar vital phenomena in dividing

into embryonal cells. A ghost in a haunted house was never credited with such extraordinary performances as the ghost in the ovum really accomplishes under the scientific eye. The manifestations defy criticism, and inherent power is admitted even by the most sceptical. The nucleus, with the protoplasm around it, becomes constricted so as to divide itself in half. The spirit seems to place an invisible belt round its body and to draw it tighter and tighter until it cuts its way through.

The two halves of the nucleus at once proceed to imitate the performance of the parent and separate into halves, somewhat as globules of mercury so easily do ; but all the globules of protoplasm remain within the original outside gelatinous coating. No sooner is a new embryonal cell produced than it sets to work to carry on the process of multiplication by division, so that in a few minutes the original parent cell becomes a multitude of embryonal cells all still enclosed within the parent skin. It is as if a bullet were to

transform itself into a spherical mass of extremely small shot without undergoing any change on its surface, or as if all the human progeny for many generations were to remain in the original tenement, yet without overcrowding.

The subdivision of the nucleus has no known cause, except the spirit. An innumerable multitude of embryonal cells are formed by the original nucleus, and each has no doubt its special duty in the construction of the Temple according to the original design. No cell divides itself after the signal is given to stop; and we have yet to find out why the cells do not go on dividing themselves until they are indivisible atoms. Since we are totally ignorant of the cause of the subdivision, we say it occurs spontaneously, which is equivalent to saying that the spirit did it.

After segmentation has taken place the ovum of an animal is still a little spherical mass of protoplasm, which, to the unaided eye, appears as totally devoid of structure as

a drop of dew, but which, by the aid of a powerful microscope, is seen to be composed of fine granular material aggregated into minute cells, each containing a clear vesicle or nucleus. The next step that has been observed in the process of development is the movement towards the surface of the cells composing the ovum so as to leave a clear fluid in the centre. We may fancy that the spirit in the centre of the ovum commands the cells to fall back; for they leave the central part and press closely together so as to get as near the surface membrane as possible, while they are also aggregated towards one part of the circumference. By mutual pressure the embryonal cells then lose their spherical form, and become polyhedral like epithelial cells; while they are at the same time pressed together into a layer which is described as the germinal membrane, or the blastodermic membrane of the blastoderm.

The blastoderm may be called the germinal skin; but we get a very erroneous notion of it if we think of it as a skin. We may best

think of it as the body, while the fluid within it may be thought of as the blood or nutrient material. The whole body is developed from the cells composing the blastoderm. The arms, legs, head, and body of a man may be supposed to go on contracting towards an imaginary centre until they are represented by a minute spheroidal body consisting of compressed cells on the surface and fluid in the centre ; so that on reversing the process, under the influence of the magician's wand, the fluid returns into the opening vessels as the compression passes off, and the cells, by multiplying, and modifying, and accumulating, and rearranging, develop themselves to form the body.

The blastoderm is no sooner formed than it sets to work to manifest its inherent energy, and to prove that it is not so simple as it seems. It seems to be one, but it only seems so because we are not able to see that it is several. It divides into three principal layers of cells, somewhat to be compared to three layers on an onion—

the epiblast, or outer, the mesoblast, or middle, and the hypoblast, or inner layer. When we see the three layers we cannot deny that they are there; but we may say that they were not in the protoplasm before they were visible to us. Since we are not omniscient, it is better for us to have humility, and to confess that there are some things we cannot see.

The separation of the blastoderm into layers may be regarded as the earliest differentiation of parts in the ovum. All the body is derived from these three layers of cells. Why does the blastoderm divide into three primary layers? Science maintains that there must be a cause for every effect. If we say that it is owing to mechanical necessity, we are simply trying to prevent thought by the use of empty words. If we say it is owing to the existence in the cell of an id, or an od, or a pangem, we had better at once confess that we mean the spirit.

The invisible power does not simply parcel off one set of cells to form the head, and

another set to form the lungs, and another set to form the liver, and so on with all the parts and organs. Why must there be three fundamental layers? Can it be that each layer represents a different element in the nature of the individual concealed in the ovum? We must watch what becomes of these three layers. Structure and function are mysteriously related, and these earliest structural changes may correspond to fundamental distinctions between functional elements of the invisible individual within the body. Those who can see the spiritual body as intellect, emotion, and will, must expect to find distinct structures set apart for the use of these three intelligent persons.

The epiblast, or outer layer of the cells of the blastoderm, gives rise to certain parts of the body which possess peculiar properties and have peculiar functions. The parts derived from the epiblast are the brain; the spinal cord; the epithelium of the organs of special sense, enabling us to see, and hear, and taste, and smell; and the epithelium

that forms a covering for the whole body, as the epidermis or outer skin.

From the mesoblast, or middle layer of the blastoderm, are derived the bones, muscles, ligaments, blood-vessels, intestines, and, in fact, all working protoplasm which has to do with the movement of matter in visible masses. The nerves, with the exception of the optic and auditory, were formerly believed to be derived from this layer of the blastoderm, but the best authorities now believe that though nerves develop in the mesoblast they are not of it.

There does not seem much left for the hypoblast, or inner layer of the blastoderm to produce, and yet it is of great importance in development. From it are derived the cells which line the intestines and lungs, and which are essential to the processes of digestion and respiration. These cells are working protoplasm; since their function is to decompose chemical compounds, and thus to move atoms of matter. The liver and pancreas are regarded as masses of glandular

cells which are outgrowths of the hypoblastic cells forming the lining of the digestive canal. The hypoblastic derivatives do not move matter in masses, but only in atoms.

Why are three primary layers of cells formed for the purpose of producing these various parts of the body? Why did not one mass of cells simply form the head, and another the body, and another the limbs? Why was not one layer set apart to form the skin and flesh, and another to form the bones, and another to form the intestines? Does the method of its development harmonise with the division of the body into three functional elements?

Why should the brain and the epidermis be developed from the same primary layer of cells? To any one who has not studied biology it must seem incredible and impossible that a special fundamental mass of cells should separate themselves at the beginning of development to form the brain and the thin layer of epithelium covering the outside of the body. What could seem more unreasonable to the mere anatomist than the

statement that the epidermis is essentially a part of the brain? Yet it is so as truly as if in the original construction of man he had been formed in a furnace and his brain had boiled over so as to cover every particle of the surface.

The epithelial cells that enable us to see, and hear, and taste, and smell, are developed from the same original layer as the epithelial cells of the skin; a portion of the surface pushed in supplying a pouch for the eye, and another portion pushed in forming a pouch for the organ of hearing. The sensorial epithelium of the organs of special sense is a specialised form of the epithelial cells of the skin. The skin is the organ of the sense of touch; and the psychologist thinks of all the special senses as modifications of the sense of touch. Smell is probably the touch of olfactory particles felt by the special nerve of smell; sight is probably due to the touch of undulating ether upon the retina; hearing is due to the touch of vibrating air felt by the auditory nerve. Why one cell enables us to

feel, and another to see, and another to hear, is incomprehensible ; but it is only reasonable to expect that they should all be developed together, since they are practically all in one continuous sheet designed to distinguish movements. The brain is enclosed in a special case, and seems to be expressly cut off from access to the outer world of the skin. Why then is it developed from the same layer as the covering of the skin ?

Mind controls matter ; and function determines organism. The individual within the protoplasm possesses certain faculties which he wishes to exercise ; and each faculty demands its own set of tools, and superintends the construction of the tools out of the raw material. Hence the earliest observable differentiation of parts in the ovum depends upon function.

Each faculty must be able to work in every part of the body which is one. No matter how widely separated the parts may be in the body, or how totally different they may appear in form, or how complicated and difficult the

process of constructing them from an original common layer may be, those parts which have to perform work of the same nature must be formed from the same root. The most accurate and painstaking observation is needed to discover how the layer of cells forming the epiblast infolds itself, and retracts portions of itself to form complicated pouches, and pushes out portions of itself as buds, and unites, and separates, and modifies portions of itself so as to cover the whole body, and at the same time to form the brain. The microscope has revealed the fact.

The biologist has now revealed what the psychologist could always see but could not explain. Men with spiritual vision saw that sensation is essentially a part of consciousness; and when those who had imperfect vision said that consciousness is a product of the senses, the man who could see clearly replied that the consciousness itself exists anterior to the senses. To the superficial, the skin is everything, and sensation is the source of all knowledge. To the pure

idealist, whose gaze is directed to the centre, the skin is of secondary importance, and the brain is the only essential primary element. The biologist proves that those are right who recognise the epidermis as part of the brain, or who see that sensation and reflection are indissolubly united in developing the conscious individual.

True thinkers can differ only because they fail to express their thoughts clearly. When a genuine metaphysician said *Nihil est in intellectu quod non prius fuerit in sensu*, he may not have really had any difference of belief from him who added *Nisi intellectus ipse*. The intellect derives all the material with which it works from the senses; but it is a matter of course that the intellect is there to receive and utilise the material. The epidermis is the portion of the brain which puts us into connection with the external world; and all our knowledge may therefore be said to be derived from sensations, but only as bone and muscles are derived from milk taken into the stomach. The living

consciousness manipulates the sensations according to its fixed laws. A philosopher like Locke may direct his attention so much to the study of the work of the senses in collecting the material of knowledge that he may seem to ignore the importance of the living spirit which constructs thought out of the material; whereas he is in reality seeing clearly all along that the work of the senses is of no value without the co-operation of the reflecting consciousness. Locke knew quite well that the greatest works of art will be exhibited in vain before the eyes if there is not consciousness in the brain, and that the pressure of a friendly hand will find no response if there is no recognition. Kant may have concentrated his gaze so intently upon the living spirit within the mind, and the methods which it employs in utilising the material provided by the senses, that he may have fancied Locke quite blind to the central operations by which alone sensations can be vitalised and transformed into percepts and thoughts.

Even in the present day it is rare to find a physician who studies the brain and epidermis as essentially one.

When we are told that the body is developed from a little mass of cells arranged in three layers, which may be regarded as concentric (though heaped up towards one section of the spheroidal mass), we naturally expect to be told that the brain is developed from the innermost layer and the surface of the body from the outermost layer. Who would expect the brain to be developed from the outermost layer along with the epidermis? The hair on the head comes from the same layer of the blastoderm as the brain; and yet that layer is not permitted to form the bones of the skull. Who but the metaphysician can see the reasons for such peculiarities of development?

The spiritual precedes and vitalises the material. The spirit that is clothing itself with a body has intellect as its supreme faculty; and no matter how great the difficulties of construction may be, the intellect

demands that it shall be seated at the centre, and at the same time shall have control over the whole circumference. Hence the whole body has to be covered with a layer of brain, since brain is the material in which the intellect prefers to reside and with which it works. No portion of the body is allowed to be outside its domain. Hence any discussion as to whether the cerebrum is the sole organ of the intellect is unscientific, since the epidermis is a part of the brain, and is essential to the intellect. The effect of mental shock upon the skin and hair is often very striking, and the spirit is injured by injury of any part of the skin; so the man who wishes to preserve his thoughts pure must keep guard over his sensations, and especially over those of sight and hearing.

Thus the arrangement of the cells in the earliest stages of development is determined by function, or the invisible faculty of the individual spirit residing in the cells; and consequently there is no probability of the

abolition of mystery by the progress of physical research, which, indeed, leads us inevitably to the region of function and of spirit. The spirit has really taken possession of special portions of the ovum for special purposes before physical research can discover anything to investigate. The colour of the eyes, and the shape of the nails, and the number of the hairs, have been determined outside the domain of the materialist; and the true philosopher, who looks from the standpoint of the Designer, says:—"Thine eyes did see my substance, yet being imperfect: and in Thy book were all my members written; which day by day were fashioned when as yet there were none of them."

The functional relation between the brain and the upper part of the spinal cord is so intimate that it would be surprising if they were not developed from the same layer of the blastoderm. We cannot discover any definite distinction in function between the brain and cerebellum, nor between

the cerebellum and the medulla oblongata, and therefore we are prepared to find them developing from the same layer of cells. The upper part of the spinal cord enables a brainless frog to perform acts indistinguishable from those governed by brain. We cannot say where the distinction in function between the medulla oblongata and the spinal cord begins, and so we find the main nervous system epiblastic.

The sensorial epithelium of the nerves of special sense, which enables us to see, and hear, and smell, and taste, is so intimately related in function to the brain that it may well be regarded as part of the brain. When we see an object we know that the action of the brain is practically simultaneous with the action of the eye. The retina and optic nerve form the essential portions of the eye, and they consist originally of a layer of epidermic cells upon a projecting portion of the anterior cerebral vesicle. The anterior cerebral vesicle is an outgrowth of the brain, while the retina is a

peculiarly sensitive layer of the epidermic cells, and both are derived from the cells of the epiblast.

The essential portions of the organ of hearing are the auditory nerve and the terminal cells required to receive the sonorous vibrations. The auditory nerve is an outgrowth of the primitive brain; while the end-cells, which are necessary to the function of the auditory nerve, are derived from an ingrowth of the epidermic cells. The brain is not allowed to come directly into contact with the external world; but the cells which are the special means of receiving external impressions are originally identical with brain.

The sensory epithelium lining the membranous labyrinth of the internal ear is derived from the epiblast, since its function is intimately related to the function of the brain; but the bony and cartilaginous structures surrounding the membranous labyrinth are derived from the mesoblast, since their function is that of working protoplasm.

Thus the structures functionally distinct are developed from different layers of blastoderm, even when they are so minute and so closely adherent that careful dissection is necessary to demonstrate them. No matter how intimately related parts may be in structure, if they differ in function we have *à priori* reasons for supposing that they have been developed from different layers of the blastoderm; and no matter how far apart portions of the body may be, or how apparently different in structure, if they are similar in function we may infer that they have been developed from the same layer. Knowing how intimate is the relation between consciousness and sensation, and knowing that the brain is the special organ of consciousness and the epidermis the special organ of sensation, the psychologist could infer that brain and epidermis are fundamentally related from the earliest period of material existence, though to the mere anatomist it would seem impossible.

The functions of the ordinary nerves are

not so intimately related to the operations of the intellect as are the functions of the optic and auditory nerves; and hence the spinal and sympathetic nerves and ganglia are not so evidently derived from the epiblast. That which has the comparatively mechanical function of conducting and transferring impressions seems not developed immediately from the same blastodermic cells as that which perceives.

All working protoplasm which has to do with the movement of matter in visible masses is developed from the mesoblast. This includes muscles, bones, ligaments, blood-vessels, and intestines, and whatever else may have for its function the movement, or the modification of the movement, of a particle of matter.

The brain is not in direct relation with the working protoplasm, since the intellect is not in direct relation with the will. Every surgeon soon learns how much more intimately related brain is to the surface of the skin than to the true skin itself, or to the

muscles, or the internal organs; although there is no part permitted to be entirely free from the influence of the brain. A superficial burn, or an ulcer less than half an inch in diameter, may cause far more intense suffering than the destruction of a limb by a cannon-ball, though there will not be so great a shock to the system. In opening an abscess the surgeon often freezes the surface of the skin, or in some way suspends its sensibility, and then there is very little consciousness of the wounding of the deeper structure. People naturally suppose that a wound of deep-seated structures must be more painful than a wound of the skin, since it is so much more dangerous; but this is a necessary delusion specially decreed by Providence to guard men against fatal injuries which might be carelessly incurred. In fact, the epidermis is a surface coating of brain endowed with special nerve sensibility to the impressions of the environment in order to enable the spirit to guard against all injury to the body which is its organ.

The brain is conscious of very slight impressions made upon the surface of the skin, and is able to localise such impressions with great accuracy so as to adopt means of defence when needed. There is a tendency to look upon the brain as the essential portion of the individual, whereas embryology confirms the teaching of psychology that every portion within the epidermis is required to constitute the complete man.

The existence of a gulf between brain and working protoplasm is brought before the mind of the surgeon every day. The jagged ends of a broken bone often cause much laceration of deeper structures without producing severe proportionate sense of pain ; and a man suffering from a broken limb may sometimes cause considerable injury by his attempts to use it, or by moving it in order to test it. When a surgeon is setting a fracture there may be grating or clicking sounds distinctly audible as the ends of the bone come into apposition ; yet when the patient is asked how it feels to have the ends of broken bones grating against

each other he may sometimes reply that he heard them but did not feel them at all. Such a statement would seem incredible to those whose knowledge of suffering is derived only from theory and fancy. The bones, and muscles, and even the trunks of the blood-vessels, are working protoplasm, and their functions are carried on without much reference to the consciousness. Even the trunk of a nerve may be cut or destroyed subcutaneously without the brain recognising distinctly the special nature of the injury, though a slight pinch of a terminal twig of the same nerve would have caused acute pain at one spot, and consequent efforts to escape from the cause of suffering.

According to the present stage of the knowledge of embryology the three layers of the blastoderm do not exactly correspond to the three functional elements of the body as described. The epiblast is a fairly distinct layer of cells, and produces the tissue which has to do especially with thought, so that it corresponds fairly well to the first functional

element. The mesoblast is not a well-marked layer, but rather an indefinite mass of cells between the outer and the inner layer; and it was formerly supposed to produce the cerebro-spinal and sympathetic nerves, as well as all working protoplasm which deals with the movement of matter in visible masses. Instead of a special layer devoted to the production of nerve alone, we find the hypoblast devoted to the production of cells which deal with the movement of matter in invisible atoms and molecules. The parts derived from the hypoblast seem to consist almost entirely of glandular cells, which can transform starch into sugar, or sugar into water and carbonic acid gas, and can rearrange the atoms in nitrogenous compounds so as to produce new compounds of the most complicated nature. The gradations of difference in the composition of the muscles at various periods of the day are so minute that the most accomplished chemist has not yet been able to state definitely the composition of a muscular fibre; and it is on

the hypoblastic working protoplasm that the constant succession of changes depends.

Since the hypoblast is a fairly definite layer of the blastoderm, it may be said that the tissue derived from it ought to be regarded as functionally distinct from the working protoplasm derived from the mesoblast. No doubt the difference in function between the working protoplasm derived from the hypoblast and that derived from the mesoblast is very great, but it is a difference in degree and not in kind ; for the one has to do with the movement of matter in ultimate atoms and molecules, while the other has to do with the movement of matter in visible masses. The function of both is to move matter ; therefore both are working protoplasm.

There is a very important reason for the separate development of the working protoplasm that deals with the movement of matter in chemical atoms. This hypoblastic working protoplasm is intended to act almost alone, and apart from the brain, nerves and general working protoplasm. The

cells which carry on the processes of respiration and digestion must never rest. During sleep, or when the individual is under the influence of chloroform or other anæsthetic, the distinctive functions of the brain, the nerves and the voluntary muscles are suspended; but death would speedily ensue if the cells lining the recesses of the lungs were to fail in their work of producing carbonic acid, or if the cells of the liver were to cease their mysterious function of purifying the blood and providing it with vital force.

A few years ago it was thought of no consequence whether the body is derived from a mass of myriads of cells which multiply and develop as simply as the cells which produce a fungus, or whether the cells display at the earliest period of development peculiar inherent differences. The general public even yet are satisfied to think that one part sprouts out to form an arm and another part to form a leg as branches sprout out of a tree; and a vast number of educated people would be disposed to say that it is mere waste of time

to study the layers into which embryonic cells arrange themselves, since no practical result seems likely to be derived from such knowledge. It may seem folly to lose lives in trying to reach the North Pole; but the progress of mankind even in material wealth has been due to those who sought knowledge for its own sake, and who were impelled by the instinct which teaches us that the whole earth is a vast store-house for our use and enjoyment. A fragment of knowledge which seemed to be most insignificant has often proved of the most momentous importance in solving the puzzles of centuries.

The cells of the epiblast, which form nervous tissue and epithelium, impart some peculiar property to all the tissues derived from them, so that even when those tissues form tumours they are tumours of an epiblastic character. The hypoblast forms glandular cells; and tumours which arise in the hypoblastic tissues remain hypoblastic in character. Whether in health or disease the tissues preserve the characteristics imparted

to them in the ovum; and the tissue that originated in one layer of the blastoderm never produces the tissue that is normally formed from another layer. Tumours are morbid growths of normal cells, the cells having escaped from the control of the spirit which carries out the original design; and it is found that great assistance is given to our efforts to understand the nature of tumours by regarding them as epiblastic, mesoblastic, or hypoblastic.

The progress of medicine as an exact science seems to depend upon a clear recognition of the functional elements of the body. Medical science has to deal with derangement or impairment of function, which is generally accompanied by some discoverable injury of structure. We know that the function of the working protoplasm derived from the mesoblast is to move matter in visible masses; and when the function is deranged we require to apply mechanical remedies. A broken bone, or a sprained muscle, or a torn blood-vessel, must be treated

by a surgeon, who deals with alterations of tissues which can be seen or felt. The working protoplasm derived from the hypoblast has for its function the movement of the atoms of matter in chemical compounds; and for deranged function of hypoblastic tissue it is reasonable to administer drugs which act chemically. Alkalis and acids are thus of great value in the treatment of indigestion when the glandular cells fail to perform the necessary chemical changes in a normal manner; and drugs like salicylate of sodium seem to supply by their decomposition the atoms which are needed to remedy some defects in the working of the cells of the liver.

Certain drugs have a special action on the tissues which have to do with thought; and the benefit derived from such drugs as tea, and alcohol, and opium, and chloral, seems marvellous when they are properly administered in suitable cases. Some drugs act specially upon the nerves; and we find strychnine producing an extremely stimulating effect on the spinal cord, while

cocaine locally applied suspends the function of the superficial nerve-endings. Nature seems to provide a special medicine for every special tissue, while there are medicines which probably act upon the fundamental protoplasm out of which all the embryonic cells are formed ; and these blood-medicines must act upon all the tissues simultaneously, though with different degrees of potency according to the degree of correspondence. As we gain definite knowledge of the body and of Nature we become able to keep a man in harmony with his environment, and so preserve his health.

The differences between tissues derived from different layers of the blastoderm are always to be borne in mind. A teacher possessed only of superficial knowledge might say that the mucous membrane beginning at the mouth and extending as a smooth moist lining for the stomach and intestines, is merely a continuation of the skin, and he may compare the intestinal cavity to a pouch produced by pushing the skin inwards ; but

such a notion is very erroneous and would lead to serious evils if carried out in practical life. The mucous lining of the intestine is not similar in nature to the skin, though it may be popularly spoken of as the skin of the bowel. There is more difference in function between skin and mucous membrane than there is between bone and muscle. The lining membrane of the bowel, which is derived from the hypoblast, loses its special function when it becomes dry like the epidermis of the outer skin, which is derived from the epiblast; while the epidermis covering the skin loses its special function when it becomes moist like a mucous membrane, as it is liable to become in eczema. The cells that cover the surface of the body are distinct at the beginning of development from those that line the internal cavities; and so it is scientifically wrong to treat any internal cavity as a portion of the surface, even though antiseptics promise to prevent any injurious result. Prejudices against the use of injections for constipation may seem due to false

modesty, but they are founded on eternal laws of nature recognised by instinct; for the distinctive function of mucous membrane, except that of the mouth and pharynx, is impaired by habitual washing.

Life becomes very miserable to those who are conscious of the processes of digestion, and who are able to feel the presence of food in the stomach some hours after it has been swallowed. We are better without such knowledge; and so the brain in the normal man remains unconscious of the changes that are continually taking place in the intestines, and large morsels of food swallowed are not usually felt in their passage through the gullet. The epidermis that covers the skin must be able to protect the individual by notifying every change and touch on its surface, and so is developed with the brain; whereas the hypoblastic cells, which are intended to be mainly digestive and nutritive in function, are specially separated at the beginning of development from the cells that form brain.

The spirit covers the outside of the body

with a thin layer of epiblast not only to provide information regarding the environment, and to give notice of danger, but also to act as a positive defence. The cells on the surface are so modified and arranged that they resist the attacks of many injurious substances; and so they must be scratched away before the individual can be vaccinated. The poison of disease is resisted by the sound skin; but poison that finds its way into the intestines is readily absorbed by the hypoblast cells, and the individual who has once swallowed them is lost. Hence the spirit places some specially sensitive epiblast at the orifices of the body to give notice of the dangerous character of substances before they enter the domain of the hypoblast.

The sexes differ remarkably in their liability to poisoning by the extension of putrefaction from the surface.

Poisoning may be by injection into the blood, or by absorption; and the next form for evil influence is poisoning of the cavity of the peritoneum.

The peritoneum in men is preserved from the evil influences of external filth ; whereas in women the opening through the Fallopian tubes permits the ingress of disease germs to poison the springs of life when purity of surroundings is disregarded.

We may expect that every difference in function will be accompanied by a corresponding difference in structure ; and that such difference in structure will exist in the earliest stages of development. Thus we may expect that voluntary muscles will be found to develop in some different manner from involuntary muscles ; and that their relations to the brain and nerves will somehow differ from the beginning—whenever we may suppose that to be. Involuntary muscles correspond to the will during sleep ; while the voluntary muscles correspond to the will during conscious exertion.

The heart is a peculiar muscle, since it acts as an involuntary muscle, although composed of striped fibres like a voluntary muscle. How the heart is developed in the embryo

of the higher mammalia and in man can only be inferred from the study of its development in lower forms of animal life ; but we may expect, on psychological or functional grounds, that there is some peculiar relation in development between the heart and the nerves, and especially the sympathetic nerves. The action of the heart is so liable to be affected by profound emotions that we speak of a man as strong-hearted when we mean that he is courageous, or weak-hearted when we mean that he is timid. A woman is said to be kind-hearted when she is sympathetic. In a man who is able to rule his conduct by the reason or intellect the action of the heart is not readily affected by any cause except something that affects the material body or the physical health ; but in proportion as he becomes the slave of his emotions his heart becomes liable to be disturbed in the strength and regularity of its action by influences which can only be described as sympathetic. A sudden knock at the door causes palpitation, and the man abandoned to the rule of

emotion cries, "How is't with me when every noise appals me?"

The sympathetic system of nerves seems to form the material basis of the connection between intellect and emotion, and to belong especially to the heart. Why the heart is described as the special seat of sympathy may be impossible of explanation; but there can be no doubt that some universal instinct prompts men to ascribe mental functions to the heart, which science at present would limit to the brain. The heart is said to feel joy, or grief; and we cannot suppose that the muscular fibres recognise emotions. So far as the ordinary cerebro-spinal nerves are concerned, the heart does not seem so well supplied with nerves as the arm or leg. Can it be that the sympathetic nerves which abound in and around the heart have really a mental function by means of some mysterious bridging arrangement between the heart and brain? The heart and the sympathetic system of nerves may be much more intimately related in develop-

ment in man than in the lower animals ; but at present authorities differ as to the mode of origin of these mysterious threads.

The blood is not to be regarded as a functional element of the body, but as the persistent manifestation of the essential unity of the body in living substance. No part of the body contains a single molecule in its composition that has not been derived from the blood ; and no part can exhibit any vital phenomenon until enabled to do so by the blood. The brain depends on the blood for the nutriment or force which it can transform into thought ; and also for the power of transforming the force. A man with a perfect brain would be strong in intellectual power only in proportion to the quality of his blood and the character of its circulation ; and poverty of blood, or weakness of heart, will reduce the greatest thinker to a condition of comparative imbecility. The retina can see fresh objects only in proportion to the renewal of the power of its cells by the blood ; for no

nerve can feel, and no muscle can move, until enabled to do so by the vitalising current.

If we did not know anything of the molecular movements and vital phenomena exhibited by cells, we might look upon the blood simply as a red fluid, which moves because it is propelled by the muscles of the heart, acting in obedience to the brain and nerves. We know, however, that every blood corpuscle possesses inherent vitality; and the rapidity of recovery after great loss of blood or profuse suppuration seems to indicate that there is a reserve of vitality stored up in the blood plasma in which the corpuscles float. The blood is living fluid. In the first stages of the development of the embryo a number of embryonic cells accumulate into a mass in the position in which the heart is to be developed, and these cells form blood corpuscles of their own accord, or in obedience to the spirit; then these primitive blood-cells or nuclei begin to circulate in the fluid with which they lubricate and surround themselves, and the mass of cells actually beats with

regular pulsations before any heart cavity is formed, and before there is a trace of muscular or nervous tissue. Blood may be said to be the fluid which the cells must form as soon as they begin to move, and which is essential to their work. It corresponds to Memory in the spiritual body.

Thus it is established that at the beginning of development the material of which the body of man is composed is divided into two functional parts, the one part having to do especially with intelligence, and the other part with matter. We may express this by saying that two invisible powers divide the ovum between them as the first step towards the differentiation of an active being. The powers reveal themselves by their action upon the matter. Where were these powers before the ovum began to divide? Perhaps where light was before the sun was made.

This division of the blastoderm corresponds to the division of the mind, or spiritual body, into the understanding and the will. Swedenborg found ample scope for the display of the

extent and clearness of his vision in the attempt to find a place for emotion between understanding and will without recognising its claim to be a distinct element ; but the physiologists of his day were unable to provide him with sound material for illustrating his knowledge of mental phenomena, and sometimes supplied erroneous assumptions instead of ascertained facts. The giant built as only a giant could build, but took the fibre instead of the cell as the fundamental unit.

The ideal is the unchangeable and the real. To the navigator the circle of the equator is the great reality, though it seems directly opposed to the most certain facts. The infinite variety of surface on the ocean must be quite lost sight of, and the gaze must be kept fixed on something that no man can ever by any possibility see. Such is true science and divine philosophy.

That the Creative Mind is composed of the Trinity of Intellect, Emotion, and Will is absolute certainty ; but it would be presumption and folly to expect to demonstrate the

existence of the Infinite. Yet, though no man can see the circle of the equator with the physical eye, the man with trained intelligence and accurate knowledge can see it with absolute certainty in the field of imagination ; and can even accumulate sufficient proof to satisfy those who are in doubt, and who sincerely and intelligently try to learn the truth.

The hope of demonstrating a revelation of the Trinity by watching the development of the material body from the moment life begins to cause visible changes in it seems to be rendered nugatory by the supposition that the mesoblast and the hypoblast must be regarded as similar in function. There seem not three primary functional layers, but only two ; and that which has to do with the movement of matter seems to leave no room for any layer of cells to develop a purely emotional element of the body. Can the most learned psychologist distinguish clearly between intellect and emotion ? We might suppose that in the human embryo there is some manifest provision for revealing the importance of

emotion as a distinct element of mind, but such a supposition would be unscientific and without any warrant from facts. Meditation on the Creative Mind shows that the relation of the Father to the Son is of a closer nature than the relation of either to the Holy Ghost. The hypoblast may correspond to the connecting mental region which the theologian can only indicate by describing the Holy Ghost as *proceeding* from the Father and the Son.

Knowledge is rapidly increasing, and conclusions founded upon imperfectly observed facts are liable to prove erroneous when more complete knowledge is gained; but if we could see functions accurately we might prophesy what the corresponding physical facts would be. Unfortunately for our self-conceit the complications are too bewildering, or our brain-cells too weak and imperfect.

On functional grounds it was decided that the mesoblast must be regarded as part of the hypoblast, and as, in fact, a development of it; for hypoblast has to move atoms of matter, while mesoblast moves visible masses

of matter. Now it is believed by experienced observers that the mesoblast is formed from the cells of the hypoblast, and is not to be regarded as the primary layer of the blastoderm. This is what we might expect on *à priori* grounds. The hypoblast connects man with the earth; is digestive and nutritive in function; takes up the matter of the outside world and incorporates it with the framework of the body, so that the man may utilise it to move masses which to the hypoblast are mountains. The mesoblast provides organs of locomotion, of active offence and defence, and, in fact, organs to do the heavy work. Hypoblast has to do with the earth, even when it gives off cells to form mesoblast; but the bones and muscles of the mesoblast may form wings.

The simplest form of animal may be regarded as a hollow globular mass of protoplasm with a layer of epiblast, or sensory tissue outside; a layer of hypoblast, or digestive tissue, inside; and a layer of mesoblast, or locomotor tissue between the epiblast and the hypoblast.

In frogs and in the amphioxus, which have been made the special subjects of study by biologists, the mesoblast is said to be developed simply from the hypoblast; whereas in insects it is said that the epiblast provides some cells to assist in the formation of the mesoblast. Can this be because the frog and the amphioxus belong entirely to the earth, while insects belong partly to the air? Nature does nothing that has not a spiritual meaning; and, while it would be the height of folly for any man to lose his time and to tire his brain by writing a book that meant nothing to him but a rehearsal of physical facts observed and more fully and accurately described by other people, every man who sees is looking at a boundless landscape from his own particular point of view, and his description of things as he sees them may supply a needed explanation of appearances that seem perplexing or contradictory to those who are examining them from a different standpoint or with a less favourable light.

The position of emotion between will and

intellect has always been a puzzle to psychologists. The biologist has got one mass of cells capable only of the movement of matter, and another mass capable of meditating upon the origin of the stars ; and he sees that some mode of connection must be found to make them components of one individual being. There must be some bridge between the will and the intelligence, even though it may seem as impossible to construct one as it would be to make a bridge with one end resting on the earth and the other end resting on the arc of a rainbow. A man sees in his imagination a house; and his hands proceed to construct a material embodiment of the idea in his mind. What connection can there be between thought and the movement of a mass of stone or wood ?

To say that nerves are the product of the senses is to some extent correct, since the senses are a product of the brain ; but nerves must exist before the hypoblast cells form working protoplasm, otherwise the cells would not arrange themselves in obedience to the

central plan. Minute threads or filaments connect all cells so as to keep them in harmony ; and the special material which forms nerves must connect the epiblast with the hypoblast from the first. When the brain loses command of any portion of the working protoplasm the cells go into a state of anarchy so as to form tumours and cancers.

It was formerly thought that nerves are formed by the mesoblast because they appear in it ; but cells have been observed to sink from the epiblast into the mesoblast, and these epiblastic cells are believed to form nerve-ganglia and nerves. Thus nerves are really offshoots of the epiblast ; yet it may be that this only applies to nerves which have a higher function than mere sensation, for it is thought that in some worms the nerves are partly formed from the hypoblast. The nerves of worms may not need to be much controlled by intellect.

What constitutes a nerve ? The connection between the brain and the feet of a man may be made by nerves more than six feet in

length, while the connection between the brain and some parts of the face and neck may be made by nerves less than six inches in length; yet no one would say that the nerves of the face are less efficient than those of the feet. The nerve-trunk is not the essential constituent of a nerve, since we may suppose it to become shorter and shorter without the slightest impairment of the true function of nerve. Suppose the nerve-trunk to vanish altogether, what is left? The essential parts of a nerve seem to be the central termination in the brain and the peripheral termination in the epidermis. We may fancy a primitive nerve to consist of two cells touching each other, and we may call the outer cell a sense-cell and the inner cell an interpreter; but we cannot distinguish between the interpreter and the brain.

A single epiblastic cell may be a sense-cell; and a number of sense-cells may be collected and united to form a sense-organ. The sense-cell must be so constituted as to be peculiarly impressed by vibrations of matter, or of air,

or of ether. A stiff hair-like process will readily be made to vibrate; but mystery only deepens when we try to learn why one cell gives us the sensation of light while another cell gives us the sensation of pain. It may be said that the cells are acted on by different vibrations; but the impression that causes pain to the skin may cause a flash of light in the eye. Some animals may, perhaps, see with the nerves of their nose; and others may smell with their feet. Cells of the epidermis provided with tentacles, or some other modification, may be called tactile organs; but the tentacles may convey some notion of smell or taste. We fancy that an animal underground cannot see because there is no light to our eyes; yet the animal may see in some way we cannot comprehend, and its sense of touch or hearing may be as vision to it. Is it likely that a mouse always sits in the dark when at home with its family and friends?

The first step towards the formation of the body cannot be taken without the agency of

nerves proceeding from the epiblast; and the unity and harmony of the whole depend upon the nerves. Two cells could not be got to form parts of one design without some means of connecting them together, and of enabling the one to regulate its procedure according to the progress made by the other. When the cells become disarranged, and there is some departure from the perfect design, there is no possible way of making known the error to the wandering cells, or of recalling them to their normal condition, except by means of the nerves. We may not be able to discover how they are developed, or to understand how they can be connected at one end with thought and at the other end with matter; yet the fact remains that nerves must form a fundamental functional element of the body.

The mind becomes bewildered in trying to discover at what time and in what manner the brain which knows gives off the nerve which feels, or how the mental plan passes into the accomplished fact; for there are always invisible connecting links inextricably

interwoven between brain and nerve, and between nerve and muscle. In the normal body the functional elements are mysteriously coeval and coequal. No nerve performs any function without the performance of some function by the corresponding muscle or working protoplasm; and no cell of working protoplasm performs any function without corresponding nerve function. Even sensory nerves cannot convey information to the spirit without the simultaneous performance of function by some muscles; for muscular movements are necessary to bring the terminations of the nerves into contact with the object, and the eye itself when it would observe intelligently employs the iris and ciliary muscle.

The mystery of life can never be completely solved, and it will never be possible for us to discover definitely how the same cell can produce tissues endowed with distinct functions, nor how the functional elements are related to one another in origin and development; for such knowledge would mean the discovery of

definite foot-steps of the Infinite Creator. Men and women are mysteries in themselves, and their relation to their offspring is not less mysterious than their own existence. We can only catch a fleeting vision of a portion of the mystic circle, emerging from the spiritual domain which defies all our powers of description, and passing as an illuminating gleam through brain, nerve, and working protoplasm to disappear in the shadow of the material atoms. The connection between the intellectual processes in the brain and the atomic changes in the material food is not given to mortal eyes to see.

The scientific student must accept facts as they appear in nature, and must endeavour to explain them, even though they may be incomprehensible. The scientific physiologist must teach that the body is composed of three functional elements whose union is incomprehensible ; that these elements are developed simultaneously in the same living substance ; that at the earliest observable period of development there is evidence of the separate

existence of the functional element ; that at all periods of development the functional elements are inseparably united ; that each functional element is equally essential to the existence of the body ; and that no teaching can be true which divides the substance or confounds the functions.

CHAPTER VI.

RELATIONS OF THE ELEMENTS.

IN studying the relations of the functional elements of the body,—brain, nerve, and muscle—we must limit attention to the typical portions of each; as in laying down the first principles with regard to light and heat, we must ignore the mysterious region where they blend. This is not an unscientific method of procedure, as might at first sight appear, but is the method pursued by all scientific teachers.

Science always assumes that there are definite boundaries in the unknown tracts which lie between adjacent provinces of knowledge. This assumption is an act of faith in ideal forms, and a denial of evolution. Some may even say that all science is based on delusion; just as the popular

notion of lakes is based on the delusion that the water in one lake is definitely separated from the water in another, though the process of evaporation is continually keeping up an invisible intermingling of the waters. From this point of view there can be no science—only chaos.

In beginning the study of the brain as a distinct functional element, it is necessary to try to concentrate the attention on substance employed only by the intellect, which knows, reasons, and commands, but which has no power of feeling or of moving matter. Such a substance only exists in the idealising imagination, just as light which is totally destitute of heat exists only in the idealising imagination.

There is a great quantity of neuroglia, or intermediate substance, surrounding the brain and the nerves ; and this substance is probably sufficiently indefinable in functions and potentialities to provide physiologists and psychologists with food for reflection so long as the world endures. Then there is

the region between the spinal cord and the brain, where functions seem at present to be inextricably mingled. These indefinite regions correspond to the region between light and heat.

The cerebellum is, perhaps, best regarded as a part of the spinal cord, since it may be almost totally destroyed by disease without any serious impairment of the reasoning power. If we suppose each muscle to be an instrument worked by a string whose end is concealed in the spinal cord, it is evident that the performer on the muscles would have great difficulty in combining them for harmonious movement in the execution of complicated feats, or even in the apparently simple feat of walking, if he had not some convenient method of pulling the strings; and therefore it is necessary to gather up all the ends into one centre such as the cerebellum, where the individual seated in the brain can easily manipulate them, so as to co-ordinate the movements of the muscles according to the complexity of the task

required. The cerebellum and spinal cord can, however, exercise control which seems to involve unconscious reason, as is proved by purposive movements in some animals when the cerebrum is quite destroyed.

In order to study the nerves as forming a distinct functional element of the body, we need to limit attention at first to the cerebral and spinal nerves; leaving out of consideration the great sympathetic system, which connects the central seats of feeling and conscious volition with the movements of the simplest working cells employed in maintaining the vegetative life of the body.

The nature and importance of the working protoplasm as a distinct functional element of the body will be best understood by restricting attention at first to voluntary muscles. Thus we leave out of view for a time the portions of working protoplasm, such as bone, which act in a passive manner; and also the portions, such as the heart, which work chiefly under the influence of the sympathetic nerves and outside

the domain of the normal consciousness. We also lose sight of the working protoplasm, such as the liver, which, under the influence and guidance of the sympathetic nerves, is engaged in moving matter as it exists in the invisible atoms and molecules of starch and other compounds.

No element of the body can perform any function without the blood, which is the fluid upon which every cell depends for life and food. There can be no intelligence without memory. The blood may be regarded as an exudation from the original germinal cell, and constantly testifies to the fact that all the body is one in substance; for all the body may be said to be extracted from the blood by the spirit inhabiting the original cell from which the blood was exuded. It has life in itself, and is able to convert dead food into living matter for the use of the spirit. Blood is not a functional element, though it maintains the life of the functional elements. It is the river which flows round all—the river which

differs from all earthly rivers by running in a long continuous circuit; the river which flows nowhere, but encircles all the land where there are gold and precious stones; the river which Adam painted as rising in the centre of the Garden and dividing into four heads at its very source.

In order to really know the functional elements of the body, we must know their relative importance and mutual relations; just as in order to understand a machine we must know the relative importance and mutual relations of the parts of which it is composed.

Since each element is essential to the very existence of the body, and even to the existence of the minutest particle of it, we must regard them as absolutely equal and co-existent; just as carbon, hydrogen, and oxygen are equally important as constituents of starch. As forming the body, we can make no distinction in the importance of brain, nerve, and muscle. An anencephalus monster may seem to negative the statement that all the elements are essential to the existence of any part of the body; but

even in such a monstrosity there is sufficient of the central commanding nerve element to determine the form and govern the growth.

Every part of a machine may be essential to its functional existence, and yet one part after another may be taken away without destruction of the central portion in which the peculiar functional action is originated. The functional elements of the body may be all equally important as forming essential constituents of it, and yet they are not equal in importance with regard to the life.

Here we become involved in ambiguities owing to the deficiencies of language and the different meanings attached to the word life. Accuracy of thought is impossible without accuracy of definition. Life is of three kinds,—vegetable or organic life, animal or mental life, and human or spiritual life. These three kinds of life appear to the believer in evolution to be successive stages of the same life. Vegetable life appears to pass into animal life, and animal life into human life. When the steps are not evident

to our senses we have a natural tendency to describe insensible gradation as continuity.

Vegetable life converts inorganic materials, such as earth, and air, and water, into organic or living material for the use of animals. Whatever can live by feeding upon earth and air, or upon inorganic material, is described by science as a vegetable; and animal life requires preceding vegetable life for food; yet the border-land between vegetable and animal life is so obscure that no man can define exactly the limiting line. Plants are described as sensitive, and there seems no more sensation in the lowest forms of animal life than in the lowest forms of plant life; yet a man who really believes that there is no essential difference between an animal and a plant—proving by his conduct that he has such belief—is rightly described as a lunatic, who may at any moment become dangerous to himself and others. Belief in an invisible ideal is made the test of sanity.

The difference between animal life and human life is a manifest impassable gulf to

any man reared in a reasonable manner; but most men are reared in a very unreasonable manner. The normal man can stand on his own feet, and sees an idea before he employs a word; the product of civilisation is unable to support himself on the produce of the earth obtained by his own labour and skill. No slave of words was selected to be an apostle. Volumes have been written about the wonderful mental powers displayed by animals; and no doubt the intelligence of the dog is very great, and the mental ability of the gorilla and chimpanzee is sometimes quite surprising. Does any intelligent peasant therefore regard them as human? The man who has learned to repeat thousands of words in various languages may have no definite notion of what he believes, and may fancy that he believes a gorilla to be a primitive man; but when men stood on their own feet they knew that any animal which can recognise the meaning and use of the compass and square is a man, and any animal unable to understand the meaning and use of the compass and square is a brute.

No definition of the human or spiritual life can convey any idea of it to any man who is not conscious of possessing the life. Every man can know the meaning of the compass and square if he chooses, but most men prefer to remain ignorant. When the countenance of a child is distorted by evil passion it will turn its face away from a mirror held up before it. The secret is open to all, but none can know it without first possessing humility. The human life may be described as the power of conscious reflection, or the power of reduplicating sensations ; and any man can repeat the words. It is the power of seeing the spiritual meaning of a material symbol, and those who possess the power are Hebrews—when they look at a garden they can see it spiritualised into the Garden in which Adam worked.

Theoretically, no portion of the working protoplasm is absolutely essential to the reflecting consciousness, human life, or spirit. Both arms and legs may be cut off, and still the individual may say he

remains where he was before. There is not a bone nor a muscle which may not be supposed absent without any essential change in the consciousness. There is no part of the lungs, liver, kidneys, or other internal organ, which has not at some time been destroyed in some person by disease or accident without causing the immediate extinction of the consciousness, or human life. Even the heart itself is not absolutely essential to the life ; since we might suppose it to be momentarily replaced by an elastic pump without the disappearance of the consciousness, so long as the brain could be possessed of a supply of oxygenated blood. It is possible that the eye of a decapitated criminal may give some evidence of conscious perception, and so prove that the brain is the residence of the spirit. The heart is, however, so intimately related to the life, in supplying memory or blood, that there is practically no possibility of life continuing after the heart fails. Death occurs when the brain fails, or when the heart fails ; and the

relation between the brain and the heart in causing death is often quite unexplainable and incomprehensible. The spirit may suddenly abandon its tenement owing to a mental shock which affects the heart while the brain appears to remain quite healthy.

Theoretically, nerve is not itself essential to the reflective consciousness; and there is no nerve which may not be destroyed without the production of any direct important effect on the consciousness. When the arms and legs are cut off, their nerves are, of course, cut off, and yet consciousness remains unaffected. The nerves which enable the individual to see, and hear, and taste, and smell, may be destroyed, separately or together, and yet he may remain apparently as capable of reflective consciousness as before. Destruction of physical senses may even be regarded as improving to the human life by removing influences which distract attention and so interfere with spiritual vision. Mankind would be poorer to the extent of "Paradise Lost" if Milton had not lost what may be

ironically called his faculty of seeing; for it was after he became blind to animal vision that he saw most clearly as a man.

The pneumogastric nerves were formerly thought essential to the life, and they are extremely important owing to their influence over the heart and lungs; yet both these nerves may be functionally destroyed without necessarily causing immediate death. Their destruction will be followed by death owing to secondary or remote effects resulting from the impairment of the processes of circulation and respiration.

Destruction of the function of the nerves causes the destruction of the function of the working protoplasm, and death must then follow; but theoretically we may eliminate both these functional elements and yet suppose the individual to have consciousness. Cases of paralysis of nearly all the voluntary muscles sometimes occur, owing to multiple neuritis, or owing to gummata or inflammatory exudations affecting the nerves near their origin, and yet in such cases the individual

may remain quite intelligent. Neither working protoplasm nor nerve can be regarded as the primary functional element, or the seat of life.

When we consider the relation of the brain to the human life, or reflective consciousness, we find it impossible to believe that a man can continue to possess intelligence or consciousness for a moment after the removal of his brain ; while we know that so long as the brain is healthy the intelligence is preserved, though the remainder of the body may be dead to consciousness, as in paralysis. A slight injury to the brain may destroy consciousness, though no injury whatever be inflicted on any other portion of the body ; while, on the other hand, a severe injury to the upper part of the spinal cord may cause such paralysis that any portion of the body below the seat of injury may be burnt or otherwise destroyed without the production of any sensation, and the paralysed man, especially if a physician, may at the same time discuss quite intelligently the nature of his

injury and the possibility of recovery. If the head of a man were instantaneously cut off by a knife so sharp as to produce no shock of concussion we may reasonably suppose that the brain would be able to recognise its own severance from the body; but under ordinary circumstances of decapitation the stunning effects of the violent blow do not pass off until the brain has lost its function by collapse of the blood vessels. The activity of consciousness, and the power of manifesting the phenomena characteristic of human life, depend primarily on brain; and therefore brain is the primary functional element.

The search for the seat of life has no doubt been of the greatest interest to mankind since the time of Adam; and yet the precise essential part or tissue in which the spirit resides is still undetermined. The unreflecting savage is content to regard his body as a unit, all parts of which are equally incomprehensible, while the reflecting savage may look with amazement at each different organ as the possible seat of life, or

as the abode of a spirit or demon. By killing animals or human enemies it is soon made evident that a wound in the hand or foot is not so apt to be fatal as a wound in the head or chest. Some parts are found to be very important with regard to the life (either human or animal), while other parts are comparatively unimportant. By experience the savage learns that the blood contains the life ; and, if he is of an imaginative and sanguine disposition, he may drink the blood of his enemies in order to acquire an increased supply of life, or in order to renew his failing powers. The modern philosopher whose vitality is exhausted seeks for fresh life by injecting into his veins the modified blood or secretions of a dog or rabbit ; but the savage is compelled to adopt the ruder method of eating the raw flesh, since he is ignorant of the use of a hypodermic syringe, and thus proves his inferiority to the civilised man of science.

When the importance of the heart is recognised the savage tries to turn his knowledge

to account by eating the hearts of his enemies, either in order to extinguish their spirits by absorbing them into himself, or in order to assimilate any desirable qualities they may have possessed. It is said that at the coronation of the King of Swaziland he is expected to eat portions of the heart of a lion, of a tiger, and of a buffalo, in order to acquire strength, courage, and other important qualities; and the plan is most excellent if the heir to the throne is compelled to capture or kill the wild animals for himself. The European philosopher naturally regards the Swazis as savages, who do not know that the gastric juice may impair the vital essence; and he may seek for elevation of nature by injecting the juice of the hearts of domesticated animals into his veins.

Experimental investigations, and facilities for recording the results, have enabled physiologists to acquire much knowledge regarding the functions and relative importance of the various organs of the body; and the parts absolutely essential to the life have been

steadily reduced in number until only a limited portion of the brain is now left in which the spirit, ego, or conscious individual can conceal itself. The surgeon now removes portions of the body which were formerly described as vital to the organism, and the individual discusses the result of the operation. The pineal gland was at one time regarded as the last possible lurking-place of the spirit, since it was single and central, and at that time seemed the only portion of the body about which ignorance was sufficiently dense to warrant the strongest assertions of certainty ; but now the surgeon would not hesitate to remove the pineal gland if it seemed necessary and practicable, when he would probably find it more important than the thyroid gland which preserves us from imbecility.

The tendency of physiologists in the present day seems to be to believe that the spirit reclines on the surface of the brain, and prefers a limited portion of the grey matter of the cerebral cortex for its camping-ground.

Professor Ferrier and other physiological experimenters have succeeded in localising many cerebral functions, or, at least, in discovering portions of the brain which are special nervous centres; and yet the local habitation of the individual spirit, and the manner in which it acts upon the nervous centres, are as great mysteries as they ever were. Moses may have studied the subject more thoroughly than any modern philosopher, and the only positive opinion he has ventured to give on the subject is that the life is in the blood; but he was not trying to localise the human life when he said this. Whatever the life may be, and wherever the spirit may reside, we have good grounds for believing that the brain is the organ of the intellect, and is the fundamental tissue which is necessary for the manifestation of the powers of the ego, or spirit, or conscious individual.

The ego may be regarded as employing the body to perform the special functions for which it has been designed; that is, to think,

to feel, and to move matter. The brain is the supreme thinking and governing element of the body; the nerves are the offspring of the brain, obedient to it, and revealing its thoughts by the actions which they cause the muscles to perform; and the working protoplasm is the substance which manifests the phenomena of life in consequence of the functional exercise of brain and nerve. Brain thinks; then communicates its thoughts to nerves, which stimulate muscles to produce movement. Thus we must regard brain, nerve, and working protoplasm as first, second, and third according to function, or from the point of view of the ego.

The relative importance of the functional elements cannot be clearly recognised except by regarding them as agents employed by the ego. Brain has no power of feeling; it can know nothing of the physical world except what is communicated to it by the nerves; it cannot reveal its power in any way, or produce the slightest effect on the physical world, except by means of the nerves. How

can it think if it knows nothing? If we regard sensations as the food upon which the brain lives functionally, and which it transforms into thought, then it seems dependent upon the nerves for its functional existence; and nerves thus appear to be the principal functional element, since neither brain nor working protoplasm can act until enabled to do so by the nerves. Yet brain is antecedent to nerves, as that which demands food is antecedent to that which supplies the food; and that which commands must be superior to that which obeys.

Working protoplasm is quite functionless when entirely separated from brain and nerve, and must be regarded as functionally proceeding from them. Its action must be preceded by the thought which plans and the nervous stimulus which excites and guides. Yet neither brain nor nerve, nor both combined, can exhibit the slightest power to obtain food, but must depend on working protoplasm to liberate the force enclosed in material molecules. Hence it might be argued that the

working protoplasm is the primary functional element; just as a foolish person might argue that food precedes and is superior to life, or as a blind philosopher might argue that the senses precede, and are superior to, the consciousness. Life must precede and be superior to its food; consciousness must precede and be superior to sensations; brain must precede and be superior to working protoplasm.

The boundary between nerve and working protoplasm cannot be absolutely defined either in structure or function. The most accomplished microscopist cannot mark the termination of a nerve in the muscular fibre to which it goes, and the fibre may still possess power of contracting under the influence of a stimulus when every trace of nerve seems to be absent. If it thus responds to a stimulus, does it not feel the stimulus? Has the muscle not power of contraction in itself without the influence of brain or nerve? When the nerve is paralysed by a poison like curare, or by the poisonous serum

of an animal dying from infection by some peculiar specific microbe, so that a stimulus applied to the nerve has no effect, the muscle is said to contract occasionally under the influence of the stimulus applied directly to its own substance. Thus it seems that muscular fibre can respond to a stimulus without the aid of nervous tissue, and therefore possesses some feeling in itself.

The primitive cell must contain the germ of all functions, and the blood may contain something of all functions, since it represents the original unity of the body; but we can learn nothing of functions by studying cells, as we can learn nothing of varieties of timber by studying seeds. Science only begins when there is some differentiation of parts, and we must not expect to learn the relations of nerve and muscle by studying protoplasm in which neither can be found. A blood corpuscle or a muscle fibre may contract under the influence of a stimulus, and thus display vital contractility. In order to be sure that muscle is free from all nervous

influence we must deprive it of all blood, since the most minute blood vessel includes nervous filaments, and the blood plasma itself must contain nervous force in some elementary condition ; but no fibre or cell can live, or exhibit any phenomena of life, if deprived entirely of the moisture which it derives from the blood ; and consequently it is impossible to say that fibre which contracts is entirely free from nerve influences.

Muscle is said to be specially endowed with vital contractility. It contracts under the influence of nervous or other stimulus. What constitutes vital contractility ? Does it imply feeling ? When the stamens of the flower of a barberry bush are tickled with a hair at their base they suddenly approach the pistil with an apparently purposive movement, and the movement has really a definite intelligent purpose. Have the stamens vital contractility and feeling ? The fact is that all vital phenomena have behind them the Creative Mind.

Whatever a muscle may do under electrical

or other stimulus applied under artificial conditions, it never performs its natural purposive movement except under the influence of nerve; and when a muscle is artificially exercised by the application of an electric current it is acting in obedience to the brain and nerves of the operator. Destruction of nerve destroys the corresponding muscle. Under normal conditions the spirit forms a plan by means of the intellect, which sends instructions by the nerves to the muscles to carry out the design; or, in response to an external stimulus, the nerves inform the brain of some peculiar change in the environment, and receive the necessary power to stimulate the muscles to meet the emergency. Muscle is functionally unconnected with brain except through nerve, so that it is not functionally the offspring of the brain; but muscular action is the result of brain and nerve functions combined, and reveals their functional activities.

The evidences of the isolation of the brain in function are so numerous and conclusive,

and the connection between thinking and feeling is so intimate, that we might be disposed to describe the body as composed simply of two elements—that which thinks and that which cannot think. Such a division would ignore the distinction in function between brain and nerve, and would correspond to the division of the mind into the understanding and the will. Nerves would then have to be regarded either as modifications of the brain or of the working protoplasm, and we should be involved in hopeless confusion of thought; yet the functional element which connects that which thinks with that which moves matter must partake of the nature of both. The recognition of this fact as an incomprehensible mystery is a scientific necessity, and may positively save us from hopeless bewilderment. Those who know it will not be confounded.

In studying the relations of the functional elements to the life and to one another we must look from the standpoint of the scientific physiologist, who tries to see the body

clearly and to see it whole. The machine must be looked at in its complete working condition. It is absurd to attempt to learn the relative importance of the parts of a machine by studying it only in fragments. The physiologist postulates the existence of an ideal perfect body; and the physician founds all medical science on the belief that man was created perfect, but has fallen from the perfect state, and can only enjoy health in proportion as he seeks conformity to the original ideal. A believer in evolution is naturally unable to understand, or even to study, the relations of the functional elements; since he denies the existence of a perfect ideal body, and has no definite idea of the elements necessary to constitute the normal man. There can be no normal in evolution, which postulates continuous change. The normal, or square, cannot evolve. The evolutionist can never be certain that a monstrosity is not an example of progress in evolution towards some higher state of existence. The student of scientific

physiology must believe that a man is a man ; that he is not a mass of protoplasm in a state of continual flux from one animal form to another, with as many degrees of humanity existing as there are different individuals. The machine was originally made in perfect working order, and the relations between its functional elements were fixed immutably by the Designer.

When the function of the brain is suspended the organic life may continue, and some phenomena of animal life may be manifested in reflex movements; but nothing of the human life, or reflective consciousness, can be discovered. Brain can retain consciousness theoretically when nerves are all destroyed, but the essential function of nerve vanishes just in proportion as brain function ceases. When complete unconsciousness is produced by a blow on the head the nerves cease to perform their function of feeling ; yet the part of the nerves most intimately related to working protoplasm may continue for a time to supply the reflex

messages necessary to keep the cells of the liver and other internal organs at work, and to maintain the processes of circulation and respiration. This automatic reflex action can only last for a brief period, though the period may be prolonged very much by another brain conferring upon the unconscious individual some of its functional product. Thus the surgeon can provide the wounded man with warmth and quiet, and even with food, or can remove a cause of pressure upon the brain; and may thus retain the organic and animal life until consciousness is regained. The brain of one individual can thus supplement the function of another.

In the normal body nerves are absolutely obedient to brain, as model children, communicating to it the impressions caused by the phenomena of the physical world, seeking the objects which are pleasing to it, and shrinking from those which it considers objectionable. Nerves give information of all pleasant and painful impressions, and of all deviations from perfect order that

occur among the working cells of the body; and they convey the commands of the brain to the various portions of the working protoplasm. Brain is their parent, governing and directing them.

In the diseased body nerves cease to be perfectly obedient to brain, and the organism ceases to be in perfect harmony with the environment. Wrong instructions are conveyed to the working protoplasm, and injurious objects are allowed to influence the body. Excruciating neuralgia, intolerable mental distress, and a sense of utter absence of harmony with Nature are consequently common experiences of those whose nerves are disordered. When the brain loses all control of the nerves we see the violent convulsions and contortions of epilepsy.

All pleasure and pain depend upon the nerves. This is a fact of very great importance, and leads to phenomena which seem contrary to reason. A man may have a brain of great intellectual power and yet may have very little pleasure in anything; while

another man who seems contemptible in comparison enjoys a life of continual delight. Thus it happens that even the deformed and mutilated may feel happy, while the possessor of powerful muscles may be miserable. The secret seems to be that the nerves are capable of finding harmony with the ideal condition, even when the brain and the muscles are functionally very inferior. No doubt there must be a corresponding peculiarity of brain to permit the enjoyment of the pleasurable sensations felt by the nerves, and there must also be a healthy condition of the muscles; but the brain as an intellectual organ may be very defective, and the muscles may be feeble in performing their special function of moving matter, while the individual is delighted with his pleasurable sensations.

The man of great intellectual power may sometimes feel himself aggrieved at the sight of the greater happiness of others who are manifestly his inferiors in brain and muscle; just as a wealthy man who

is miserable looks with envy, and perhaps a tinge of anger, at the merry-making of a band of jolly beggars. It seems natural to think that intellect and wealth should have the power of despotically commanding success in the securing of happiness; and yet capacity for enjoying scenery, and music, and sentiment, cannot be obtained by reasoning or bought by money. The poor and weakly boy may have the fibres of his retina so constructed that the beauties of form and colour, even in the loneliest solitude, provide him with pleasures so intense that they cannot be conceived by those who would fain pity him; or the nerves of his ear may be so connected with his imagination that the mysterious harmony of sounds converts the garret into a paradise, so that the imperfect revelation which the composer is able to convey to common men of the music sounding in his soul seems a priceless treasure obtained from some miraculous source. The nerves determine whether the organism is in harmony with the environment or not,

and to him who is the possessor of the harmony which confers the joy of life everything around conveys impressions of unspeakable pleasure; the heavens seem to rejoice, and the earth is glad; the hills are bounding from the surface to kiss the sky; the flowers deck themselves in holiday attire, and the woods wave their branches to express their thankfulness for life; sunshine and hail-storm, tropic heat and arctic cold, gently-falling dew and crashing thunder-roar, microscopic animalcule and gigantic whale—all things in heaven and earth are fountains of intense enjoyment, and seem to overflow with praise and gratitude to their Creator. The philosopher who does not know how the organism may gain harmony with its environment ought to sit down in dust and ashes and bewail his ignorance, or ask some peasant who knows to instruct him.

We may compare the brain to an electric battery, the nerves to the wires which conduct the electricity, and the muscles to the

machinery which moves material bodies in obedience to the electric stimulus ; but the intricacy of the mutual interdependence of brain, nerve, and working protoplasm cannot possibly be fully illustrated by anything in nature. The human body is the highest product of creation, involving the principles employed in the creation of all lower products ; and the greater cannot be fully illustrated by the less, or the more complicated by the less complicated. We may to a certain extent clearly understand the phenomena exhibited by the elements of the physical body, and may successfully endeavour to imitate them, since man has the power of knowing the thoughts of God revealed in nature, and of imitating the processes adopted ; yet, even if we could construct an electric engine in which the battery would be automatically charged by the machinery which it works, and in which the conducting wires would at the same time convey the force necessary for the action of the machinery and the food necessary for the

consumption of the battery, we should still fail to give even a moderately faithful illustration of the relations of the functional elements of the body. The whole apparatus would require to obtain and prepare the materials for its own use, and every portion would need to be endowed with the power of repairing and improving itself automatically. In fact, in trying to construct a perfect illustration of the functional working of the body we find ourselves involved in the attempt to produce perpetual motion.

Science must accept facts, whether comprehensible or not. We cannot imagine how that which thinks and cannot feel can be connected or related to that which feels and cannot think; nor how that which thinks and cannot move matter can be related to that which moves matter and cannot think; nor how that which feels yet cannot move matter can be related to that which moves matter and cannot feel. We cannot form the faintest idea as to how brain thinks, or how nerves feel, or how muscles move

matter; we can form no idea as to the manner in which the several elements act upon one another, and we cannot imagine how they are united to form one body. They are all incomprehensible in their being, and in their working: yet we know that brain precedes and is superior to nerve in function; that nerve acts as the intermediary between brain and muscle; and that muscle by its action provides the whole body with nourishment and preserves the health.

When men have perfect knowledge they will have no doubt as to the relations of the functional elements; and so long as they have any doubts they cannot be in possession of clear light. Heaven is the place where there is clear light and no doubters; and no one who wilfully persists in ignorance can be fit for the society of those who love to live in the bliss of knowledge.

CHAPTER VII.

CULTURE OF THE BODY.

THE final aim of medical science is the cultivation of the body to perfection, or the production of the state of absolute health. The scientific physiologist takes for granted that there is a perfect ideal condition, and he describes all the vital processes and phenomena as if occurring in this ideal condition. He ignores disease and imperfection. When the brain, or the nerves, or the working protoplasm, cannot act according to the ideal standard, the physiologist says there is something abnormal. He virtually says that nothing is real but the ideal.

It is commonly supposed that the final aim of medical science is the cure of disease and the alleviation of suffering. Disease and suffering are supposed to be inevitable, and

the physician is expected to devote his life to the study of disease and the discovery and utilisation of remedies. Men wait until they are positively suffering before they ask for advice and assistance, and a degree of discomfort and dissatisfaction is tolerated as natural. The physician is regarded simply as the reliever of suffering, and men quote with satisfaction the saying, "They that are whole need not a physician, but they that are sick." The number of the perfect, however, is not sufficiently great to affect the demand for medical practitioners.

When a man regards himself as perfect it is folly to ask him to strive towards a perfect ideal, or to expect him to take a deep personal interest in the study of hygiene. A sense of imperfection is essential before there can be any desire for improvement; and there are multitudes who are not aware of their own defects, though they can always see the defects of their neighbours. A young man who is healthy, strong, and handsome, may sometimes assert that he is the most

perfect man on earth, and that no one could suggest any change in him which would be an improvement. Yet his friends do not consider him a perfect man; and even women who admire his strong and graceful form may despise him. Some may find fault with his reasoning power, some may say that he has imperfect power of appreciating music, some may find him deficient in agility. All will agree that the man is a fool when he fancies himself perfect.

Every rational man may be described as a worshipper of a perfect ideal body. No man can become perfect; no man can define what he means by perfection; and yet every true man is striving all his life to attain perfection. The conscious endeavour to improve from a sense of duty is the distinction between the man and the brute, though many men only improve by instinct and competition as brutes. The influence of those who are voluntarily striving upwards elevates the mass of those who are brought into competition with them; and the child naturally

takes his parent for an ideal, until he is wise enough to see the parent's imperfections. Thus every man may serve as an ideal to an inferior who admires him. Wise men look to the Perfect Ideal.

The cultivation of man to perfection is the great problem of the present day, and is a subject of the greatest importance and of infinite complexity. The modern physician must not confine his attention to the cure of such manifest diseases as cholera and small-pox, or even to the prevention of them; he must be prepared to teach the imperfect man how he can become more nearly perfect. When men are in a state of ignorance and heathenism they are quite satisfied with the physician who can cure disease; but when they learn that all disease is the result of opposition to natural laws, they expect the physician to teach them how to avoid becoming affected by disease; and when they have been taught that their birthright is happiness in a state of perfection, they ask to be taught how to remove all the

weakness and imperfection inherited from diseased ancestors.

When Lister proved that the blood is naturally healthy, and is even antagonistic to disease, his teaching came as a new revelation to the world. Men had become so confirmed in the delusion that the blood is naturally corrupt and diseased, that they did not think of seeking happiness by cultivating the body to perfection. For many centuries the blood had been regarded as the source of all disease, and in many cases of sickness the physician endeavoured to abstract as much blood as possible without manifestly destroying the life of the sufferer. Cultivation of a body depending on a corrupt fluid could only increase misery; and therefore the state of absolute health was sought by starving and injuring the body as much as possible. No one thought of studying the causes of disease as coming from without, or from violation of natural laws; and physicians did not know the importance of cultivating the body so as to enable it to resist the

onslaught of the surrounding microbe demons, or of strangling the demons in their cradles. The strongest men often appeared to suffer worst from plague and fever ; so what inducement was there to seek for the happiness of absolute health by cultivating the body ? The Creator was regarded as a horrible fiend delighting in human suffering ; and the demon-worshippers naturally treated the cultivation of the body as impious. Yet Lister was preaching a very ancient gospel when he was demonstrating that man is naturally endowed with healthy blood, or that God is good.

If we think of ourselves as the noblest specimens of humanity that have ever existed on the earth, and of our primitive human ancestors as superior apes, we cannot have much respect for what is described as the wisdom of the ancients ; but when we have sufficient knowledge and humility to believe that the worship of ancestors has its foundation in historical and philosophical truth, we are willing to listen to the teaching of Moses,

and Abraham, and Adam. Now, the ancient Hebrews always taught that the cure of disease is the mending of that which ought to have been preserved unbroken; and that the true aim of the physician is the attainment and preservation of a perfect condition in which no suffering or disease will occur. The Hebrews knew that man was created perfect, that he has fallen from perfection, that his blood or life is still healthy, and that it is his duty to strive to regain perfection. They knew that the Creator desires men to be happy and joyful, and that enjoyment of existence becomes more and more intense as men approach perfection. Every Hebrew regarded himself as a spirit possessing a Rough Ashlar, which it was his duty to make proper, symmetrical, smoothed, and polished; and he knew that he could never work successfully except when under the surveillance and guidance of the All-seeing Eye.

The legislation of Moses always aimed at the production of perfect men and women;

and the measure of his success is to be found in the victories achieved by those who obeyed him. The normal man has no fear of anything; for weakness, cowardice, falsehood, selfishness, indolence, and all other imperfections are abnormal. The children of those who followed Moses for forty years in the desert were willing to attack and able to overthrow any number of enemies, and some of their descendants appear to have suffered little degeneration. There are many societies being formed in the present day for the attainment of the ideal perfect condition; and they will command our respect when they produce an army superior in courage, strength, and agility to an equal number of the Hadendowas who were destroyed with modern weapons in the neighbourhood of Suakim.

Perfect ideals were always kept before the Israelites by Moses. No man with any noticeable imperfection was permitted to be a priest, and no animal deformed or imperfect could be offered in sacrifice. Disease was regarded

as evidence of sin, and every person with manifest disease was compelled to remain outside the camp of the healthy. Those who had been properly reared in obedience to God received possession of Canaan; and though their great leader had inherited or acquired infirmities which prevented him from entering in, he was permitted to get a glimpse of the good things in store for the people when the weak and the diseased had been replaced by the strong and the healthy through his long and arduous labours.

The ancient Greeks had received much instruction from the Hebrews, while many of their leaders were probably of Jewish descent, and therefore we find them aiming at the production of perfect men and women. There is abundant evidence that the Greeks succeeded in approximating very closely to the physical ideal, so that it is extremely difficult to suggest any improvement in their representation of the human form; while Marathon, Thermopylæ, Salamis, and the victories of Alexander proved their superiority. They knew

that it is impossible to cultivate the physical body to perfection without cultivating the spiritual body or mind, of which the physical body is the revelation and instrument. Socrates and Plato were Hebrews ; that is, they saw the world of mind behind the physical world. They knew that the attempt to worship a physical ideal alone could only lead to the production of a superior race of animals, or to the extinction of mankind ; so that, while they were careful to cultivate the physical body by exercise and discipline, they were still more careful to cultivate the intellect by the study of geometry and philosophy. Why, then, did the Greeks fail to become perfect ? Why did they quickly fall back to the level from which a few great leaders had raised them ? They cultivated the brain towards its perfect archetype by the study of mathematics and philosophy, and they tried to cultivate the muscles to perfection ; but they failed because they did not know how to cultivate the nerves. Sensuality, envy, hatred, and cruelty intervened between

the intellect and the action of the will as revealed by the muscles. Intellectual ability and energy of will cannot produce a perfect man when the prevailing emotion is selfishness.

The descendants of the people who followed Moses stand out in history as the bravest, the most intellectual, and the most truly poetic people who have ever existed. Their influence still dominates the world. The achievements of Joshua, and Samson, and David, seem marvellous fables until proved true by incontestable evidence; the wisdom of Solomon cannot be explained away by the most ignorant modern writer, who tries to repeat it as his own original thought; and every genuine poet will always find the most refreshing and invigorating wells of sympathy in the literature of the Hebrews. Solon, the lawgiver, may be admired for his patriotism, his disinterestedness, and his worship of absolute justice; but it must not be forgotten that Moses had given the world better laws and a better example many centuries before any Greek philosopher was born.

If we admit that the Israelites were more nearly perfect than any other people, it is very important to consider what were the conditions which probably led to their superior development. Those who followed Moses had the advantage of being agricultural labourers, and the descendants of agricultural labourers, who were always compelled to take as much physical exercise as their strength could endure, and to live upon the produce of the earth in its primitive simplicity. For several generations they had been obliged to eat their rice without artificial flavouring, and their livers had not been congested by an excessive amount of nitrogenous food and indulgence in indolence. They had also the advantage of the strictest moral training, under conditions well calculated to weed out the degraded; for those who were not thoroughly sincere in their worship of God had very strong inducements to separate themselves from the true Hebrews. If a number of men and women who are physically and morally as sound as the Israelites

who followed Moses will live for forty years in the desert, striving to attain the Divine Ideal, and submitting to the most rigid discipline of the most exact hygienic science, their grandchildren are certain to be more nearly perfect than ordinary men. In the present day, however, there would be some difficulty in finding suitable candidates for perfection, since even the agricultural labourers have their teeth so badly decayed that the modern Moses would need to provide a large supply of artificial teeth or sausage-machines for the use of his followers, and few of them would be satisfied with rice without sugar; while there would probably be still more difficulty in persuading or compelling the children to submit unflinchingly to the necessary moral and physical restraints.

The work of Moses is well worthy of admiration, and yet his plan for attaining the absolute health of perfection must be rejected, since his rules are too severe for men to bear. The number of his followers at the end of the forty years was only the same as at the

beginning, so that the mortality among the unfit must have been very great, or the rate of increase must have fallen far short of that which is necessary for the fulfilment of the command to cultivate the earth as a garden. Besides, his success was only partial and temporary ; for the successful warriors themselves soon became enfeebled, and many of their descendants became more cowardly and miserable than their ancestors in Egypt. A man who is nurtured in poverty and hardship will have a good appetite and satisfactory powers of digestion, so that he can thoroughly enjoy the good things of life when he gets into a land flowing with milk and honey ; but then he may produce disease by indolence and excess, so that his last state may be worse than the first. He is only successfully trained when he enjoys life to the last, and trains his children so that they may find it equally delightful. The modern physician must be superior to Moses in knowledge of the means of obtaining possession of the Canaan of absolute happiness. The sufferer from cancer

is not made comfortable and happy by the assurance that his grandchildren will know how to cure or prevent the disease ; and the man who recommends forty years in the desert before happiness can be obtained, and even then cannot ensure its permanency, cannot be regarded as offering the Gospel to mankind. The sufferers demand something better. The Gospel that men need must teach them how to be thoroughly happy from the very beginning of their progress towards absolute health, and to find their journey a continual delight.

Whether man can become perfect or not, the true physician must always ask himself, How is the state of perfect health and happiness to be produced ? How can the bliss of Eden be regained ? Adam assures us that Eden can only be regained by those in whom the Compass and Square can detect no imperfection, and that the entrance is guarded by the Cherubim with the Flame of a Sword. Christianity assures us that the Cherubim can be appeased and entrance gained, though

no one can remain within except by cultivating the Garden in obedience to the Proprietor.

The physician must teach men how to attain to absolute health, and yet he cannot define what he means by health. So long as it is possible to detect any imperfection in a man, he cannot be described as the possessor of absolute health. It is said that no artist can find a model capable of satisfying him in every respect ; and that in order to produce a perfect statue or painting, it is necessary to select a number of models, and to select from each that which is nearest perfection. Thus the only real perfection is the ideal in the artist's mind. Absolute health may be defined as consciousness of harmony with the archetypal body ; but the archetypal body cannot be defined.

How are we to recognise the physical ideal ? How are we to know what constitutes absolute health ? No man who isolates himself can be a reliable judge of his own health, or of his distance from

perfection ; for it is only by associating with others and comparing ourselves with them that we become conscious of our defects. Each possesses some peculiar likeness to the ideal, though no one attains to it, and therefore each worker must look not to his own superior gifts, but to the superior gifts of others. At the same time, each must look upon his own defects rather than upon the defects of others. If a man remains isolated, or associates only with those defective, like himself, he may fancy himself quite sound, when he is in reality very unhealthy. A man who has a diseased heart often thinks himself perfectly healthy, and he may appear so to others, until he attempts to keep pace with healthy men in running up a hill or in some other exhausting exercise ; and those who suffer from pulmonary consumption often feel very comfortable, and fancy themselves strong, so long as they are carefully nursed, and are prevented from making any effort which would test their power of endurance.

The true test of health is the capacity for

enjoyment which is satisfied. A man who is always in a stupor, or in a state of imbecile lethargy, may not suffer in any way, but no one would describe him as healthy. A Buddhist may long to become as insensible as a cabbage, or to be permanently chloroformed, but that is not a longing for health. A sloth seems to have a fairly comfortable life, yet the physician who tells a sufferer from gout to aim at becoming like a sloth, or to worship the sloth as a god, can hardly be regarded as worthy of the respect of a scientific student. The scientific physician must try to make the lame man able to dance and the dumb to sing.

So long as there is any element or part of the body which is capable of performing any function which it does not at present perform, or of performing its present functions more efficiently, there is a higher degree of health to be attained. The healthy performance of function is always a source of pleasure, and any system of medicine is unscientific and false if it does not aim at

enabling man to rejoice with the greatest possible delight in his life. The state of absolute health cannot be attained, because the potential capacities for enjoyment are infinite. No man can ever truly say that his eye is satisfied with seeing or his ear filled with hearing, for the better the senses are trained to appreciate the beauties of nature, the vaster becomes the field of enjoyment and the more delightful its pleasures, until the power of rejoicing in the Infinite yields the ecstasy that is ineffable.

The cultivation of man to perfection may seem to demand the reduction of all to one uniform pattern, but we require variety for our enjoyment; and so the Creator has taken care that no two men shall be exactly alike, and that no man shall be exactly the same for two days in succession. Thus we have a different standard of health for different people, and even for the same people at different ages. Our notions of the perfection of a man are not the same as those

we form of a woman; and we describe a youth as unhealthy when he is easily fatigued, while we regard an older man as normal though equally fatigued by the same exertion. Each man is created so that he may rejoice in health, though differing very widely from his equally healthy neighbour, and though he may fall far short of the ideal standard. The joy in life increases as he approaches perfection. The consciousness of health is in each individual; and, since no two men are exactly alike, no one can judge his neighbour infallibly, or determine with certainty what he requires for his health. Each must work out his own salvation.

The Creator has mercifully blessed us with self-conceit, so that we may be happy in spite of our imperfections; but when a man fancies that there is no great distance between himself and the most perfect man that could exist, he is perilously near the dead-level of animalism, in which there is no possibility of worship. There is something to admire in everyone; and, while a man is right in

deriving pleasure from the contemplation of his own blessings, there is no man of sense who does not feel that he is in some way inferior to his neighbour. Even the dwarf of Central Africa may have acuteness of observing power and agility of movement which the European may strive in vain to excel. A man may not be a good wrestler, and yet he may sing well. Unfortunately, it is often impossible to convince a conceited man that he is very imperfect, or to persuade him to look upon another man as his superior. It is not easy for the confident orator to avoid despising the modest thinker who cannot talk fluently : yet Moses had to teach Aaron what to say, and when the voluble priest tried to take the place of the true theologian and legislator his inferiority soon became manifest.

There can be no improvement until there is humility. We cannot take the first step towards a higher ideal until we recognise that we are inferior. Religion can have no scientific meaning to the man who does not

know that he is a sinner. A ploughman who regards the gait and rate of progress necessitated by his employment as the most graceful and expeditious to be desired, may remain quite satisfied with himself so long as he refuses to believe that he would be more useful or capable of more enjoyment if his muscles were better cultivated. When he is thrown into the society of acrobats and dancers, he awakes to the fact that his muscles are not perfect, even though they are very powerful, and wider ideas of the possibilities of muscular improvement arise in his mind. By trying to imitate the dancer he learns that his muscles are abnormally slow of movement, and that his nerves are deficient in co-ordinating power; and the more he tries to improve, so as to be a perfect man, the greater the gulf becomes between him and his ideal.

Men are always longing for a physician able to teach them how to obtain absolute health. They wish to feel satisfied and happy, and they commit many sad blunders

in their search for the Kingdom of Heaven. Opium and alcohol seem natural remedies for neuralgia, and wine is relied upon to cure depression of spirits. It is easier to swallow a medicine than to cultivate the body. The lazy woman possessed of money prefers to wear an electric belt rather than do useful work. Demand creates supply, and the stupid wretch who longs for somebody to give him health can always find impostors ready to urge him to close his eyes and open his mouth.

The wanderer knows that a guide is necessary ; but what are the qualifications of the guide ? The sense of imperfection makes a man unhappy, and he wants a physician to teach him how to secure the consciousness of health. Who is to be the physician ? Is the vain dreamer to be trusted ? Must the simple always be the victims of plausible thieves ? Can the wanderers not be delivered from the blind guides who lead them through bewildering mazes of words into pestilent swamps and horrible caverns ?

When Moses was engaged in his memorable attempt to produce a race of perfect men, he saw the necessity of securing the perfection of the physicians or teachers. Before we can teach others how to become healthy, we must ourselves have experienced the consciousness of health, and know that health is attainable. The physician who is diseased, and yet regards himself as healthy, is a danger to the community, and is certain to lead men astray so long as he has not humility or sense enough to confess or to recognise his diseased condition. Civilisation enables the physically and mentally debilitated to live at ease and to remain in ignorance of their debility, so that they pass their lives under the delusion that they are normal men. Such debilitated and diseased persons are often voluminous writers and influential teachers; and they fancy that their own infirmities, or their morbid thoughts and feelings, are normal, and are shared by all mankind. The dyspeptic doctor fancies that other people are poisoning themselves when

they eat what disagrees with him; and a deaf man may firmly believe that an assembly of dancers have lost their reason. When the sickly ascetic who poses as a philosopher shivers with cold in the winter, he proclaims that Nature is the cruel tormentor of man, and that man is compelled to spend his earthly existence in a vale of tears; for the miserable fool is too selfish to sympathise with the rejoicing skater and huntsman. Men who are so discontented and unhealthy that they cannot rest, persist in lecturing their neighbours about the means of obtaining a state of satisfaction and happiness; and the healthy neighbours are often silly enough to listen to the garrulous invalid who tries to persuade them that they are as wretched as himself. Moses tried to prevent dyspeptic grumblers from marring the happiness of the innocent, and from teaching that the Creator is satisfied to see men diseased or suffering. The man who cannot rejoice in his life must study himself to discover wherein he is diseased; and

whoever says that God desires men to remain in a state of imperfection and suffering must be regarded as deluded by the devil.

It would thus appear that any man who attempts to teach others how to obtain the state of absolute health must believe that he himself is perfect; but that is only true when the teacher delivers his own message. A very imperfect and foolish man may be perfectly reliable as a teacher if he is careful to repeat nothing except what he learns from a perfect teacher. The anatomist, the physiologist, or the chemist, is infallible so long as he simply states accurately-observed facts of Nature; for he is then repeating the teaching of Perfect Intellect.

Perfection of the body can only be attained by the harmonious development and cultivation of all its elements. The blood must be healthy, and the air must be kept pure. Nature teaches man to cultivate the whole body, and provides him with healthy blood and pure air. The American Indians formerly lived under conditions which approximated

to those indicated by Nature, and the result was superiority of brain, nerve, and muscle. Habits of observing accurately and of reasoning correctly had to be adopted in order to obtain means of subsistence, and to contend successfully with enemies; all the senses were diligently exercised in order that the first threatening of danger might be seen, or heard, or felt; the muscles were necessarily trained to a very high state of efficiency, and the whole body carefully preserved in health, since existence often depended on the power of enduring fatigue. In brain, nerve, and muscle the American Indian was often superior to his European conqueror, until the European was developed under similar or more favourable conditions.

A weakly coward armed with a rifle may feel himself superior to the noblest man who has no weapon but such as he can make for himself. The library scholar who considers himself an example of the survival of the fittest is not willing to admit that the so-called savage can be as intelligent, or have his senses as fully

developed, as the man who has had the training of a university ; and even a farmer who cannot talk fluently is often supposed to have no more intelligence or practical sense than a voluble teacher of languages. Some modern teachers say that savages have very little power of discriminating shades of colour, and that such power attains its highest perfection in the fully evolved natives of large cities. The inability to arrange threads according to their colour is regarded as evidence of deficiency in visual perception ; but let every change of colour indicate a friendly or a hostile disposition in the person who displays it, and the savage will recognise it with his naked eye when the psychological philosopher will gaze in vain through his telescope. The savage will readily select ripe from unripe fruit by a difference in tint which his instructor in visual perception will be unable to distinguish. Before concluding that a Zulu is incapable of producing or distinguishing musical sounds, it would be well to impress on his mind that the difference in tone or pitch

marks the difference between a friend and an enemy; and then his ears will be found much more sensitive than they seem to be when he is puzzled by sounds which have no significance to him.

The man with superior brain always becomes the ruler of men. He may be neglected and despised for a time, but in any emergency he is instinctively looked up to for advice. Intellect is in proportion to quality, and form, and size of brain, and men speak contemptuously of the "feather-brained." The brain that is excellent in form and quality may be small, while the large brain may be so unhealthy that its possessor may be imbecile; the brain itself may be good, but the heart may be unable to supply it with sufficient blood, or the blood may be impure, and then mental weakness must result; yet, other things being equal, brain-power determines supremacy.

A healthy, intelligent man naturally cultivates his brain as the most important element of his body. He exercises it in pure reasoning, and has a profound pleasure in making

calculations, and in discovering laws of nature. As the result of his study he can instruct the mechanic in the principles by which he must be guided, and can make the stars the servants of the navigator ; he can teach the electrician how to detect the locality of a fault in a submarine cable, and can calculate for the soldier the velocity and momentum of a cannon-ball. Thus he becomes the guide, the instructor, and the supreme authority ; and yet he may be a very imperfect man, and may know little of the joy of health. The superior brain may be on the body of a dwarf, the muscles may be undeveloped, and the limbs deformed. The great reasoner may be insensible to all the pleasures that depend on strong muscles and cultivated senses. He may be quite incapable of appreciating the happiness of the hunter or the mountaineer ; the most accomplished cook may look to him in vain for a sign of satisfaction in the flavour of the delicious viands placed before him ; the musician and the painter may be unable to add anything to his enjoyment. The man

who fails to cultivate his nerves and muscles cannot enjoy health, and even his brain will become weak.

When the man of superior brain has revealed the laws upon which a stable condition of society may be built, and the means of securing abundant food and wealth with little labour, his pupils and children naturally try to find the greatest enjoyment in the new conditions of life. The cultivation of the brain is laborious and difficult, and it seems to afford little pleasure; self-denial is needed, and there is a long time to wait for the harvest. The nerves provide a source of immediate pleasure, and the gratification of the senses is a very evident and easy way to happiness. Great attention is therefore devoted to the cultivation of the nerves, while the supremacy of the brain is liable to be forgotten. Food that is pleasing to the taste is naturally preferred, and the taste is cultivated without regard to the warnings of the scientific physiologist. Indigestion then results, and the nerves that gave great

pleasure are found to be capable of giving excruciating pain.

Those who have sought for the happiness of absolute health by gratifying their nerves regardless of the claims of the brain soon produce a state of such misery that they rush to the extreme of neglecting both brain and nerves for the cultivation of the muscles. The man who has produced dyspepsia by his irrational mode of life learns by experience that muscular exercise assists digestion; and, since his brain is not supreme, he has not enough common-sense to see that the whole body must be cultivated in order to secure happiness, or to make men perfect. If his own constitution seems too much impaired to be restored to a healthy condition, he becomes the lecturer of youth, and advocates the avoidance of everything which he is unable to enjoy; while he protests that the only happiness is in self-suppression. The repentant debauchee becomes a Tolstoi.

The cultivation of the muscles is essential to the production of a perfect man; and yet

when the most muscular men come forth to claim their legitimate place in the world of human beings, they are thought of no more importance than so many elephants taught to do feats of strength. The instinct of mankind is not satisfied with the mere muscular prodigy as an ideal. The gymnasium is extremely valuable in the cultivation of men to perfection ; and yet the mere cultivators of muscle are often seen to have the " villainous low forehead " of a Caliban, so that they know nothing of intellectual enjoyment, and are insensible to the pleasures of the refined. The tendency of the mere cultivator of muscle is to descend in the scale of intelligence ; and when placed in circumstances in which he is not compelled to exert himself, he is apt to cease the cultivation of his muscles, and to seek for happiness by the exercise of the working protoplasm which has to do with the movement of the atoms and molecules of food. Thus the race of gluttons is produced, with low forehead, broad face, and dull and brutal expression.

The scientific physician knows that the ideal body must be perfect in each of its elements, and that no element can be properly cultivated without the simultaneous and harmonious cultivation of the other elements. The man who gives the greatest attention to the cultivation of his brain must be taught that he will fail to enjoy the happiness of absolute health if he neglects his nerves and muscles. The wealth of modern society permits of the excessive cultivation of the nerves, to the neglect of the brain and muscles; and the result is weak, morbidly-sensitive men and women, who are utterly unreliable, and to whom every trifling pain is an agony. Every unusual sound is alarming; and the mother goes into hysterics when the clothes of her child take fire, so that the child is allowed to be burnt to death. Men have no rational control of their feelings, and abandon themselves to every gust of passion, so that they are a source of danger to all around them. The nerves are worshipped as supreme; and men attempt to enjoy absolute

health by listening for ever to enchanting music. It is quite forgotten that nerves which are not obedient to the brain can only cause convulsions and disease. Woman may try to find happiness without subjection to man, or devotion to the training of a child; and may not understand why she becomes more and more discontented and miserable. The superficial teacher of theology asserts that love is the greatest thing in the world^s; though the peasant reared under natural conditions knows that the love which would give a poisonous berry to a child is not so great as the wisdom which can guide the love to a knowledge of what is wholesome.

Man may be compared to a machine, the parts of which have become disarranged and injured by rust and dirt. Ignorant workers try to mend the machine by hammering at the individual parts without knowing their uses or their relations to the whole. The true physician must explain the uses of the various parts and their relations to one

another, so that they may be fitted to work in harmony.

No man can attain the state of perfect knowledge and health without knowing that the body is composed of brain, nerves, and working protoplasm; that these three are absolutely one and indivisible in substance, and yet are entirely separate and distinct in function; that each is incomprehensible in substance and function; that they are all equally essential to the formation of the body; that they are all coeval in substance; that no one can be cultivated as a separate individual; that brain is supreme in function; that nerves are the offspring of brain in function; that the function of working protoplasm is the result of the co-operation of brain and nerves; that the body must be cultivated as one body, and yet that each of the three elements must be cultivated; that nerves partake in function both of the function of brain and of the function of muscles or working protoplasm; that nerves at one extremity are merged in brain, and

at the other extremity are merged in muscle; that brain can know nothing of muscles, and muscles can know nothing of brain, except through the intermediation of nerves.

Knowledge of the structure and composition of the body has no necessary relation to health; and so men may be healthy, though knowing nothing of brain, or nerve, or muscle. Thus it would be absurd to say that, except a man believes faithfully in all that is here said about the relations of brain, nerve, and muscle, he cannot possibly enjoy health; and yet it would be correct to say that, except a man keep whole and accurately this teaching, he can never enjoy perfect health. Savages, and even animals, may remain healthy by instinct without knowledge, if they unconsciously obey the dogmas they cannot comprehend.

Behind the material the theologian perceives intelligence at work. However massive the body and voluminous the drapery, and however minute the structure and multitu-

dinous the variations, he sees in every fold and in every movement a revelation of the Mind inhabiting the clothing. It is not the pulpy mass within the skull which plans the engine and regulates its action, but the intellect which employs the brain as its medium for communicating with the physical environment. The nerves and heart of a mother weeping over the threatened destruction of her children are of themselves mere dust of the earth; yet they provide the mysterious necessary link by means of which the outflow of emotion is exhibited. When men are called upon to rescue the perishing their success may seem to depend upon the strength of their muscles; but the essential living power is the will, which uses the muscles in obedience to the intellect acting through the emotions.

Man is a trinity in unity. He is composed of three functional elements, which are distinct and yet are indivisible. He is the true *Shekinah*, or revelation of the Creator; and the Son of Man is also Son of God.

Every man with perfect spiritual vision must believe that the mind is composed of intellect, emotion, and will; that intellect is essential to the mind, that emotion is essential to the mind, and that will is essential to the mind: that intellect is incomprehensible, that emotion is incomprehensible, and that will is incomprehensible: that intellect is supreme, and precedes emotion and will: that emotion is the offspring of intellect, and obedient to it in the perfect mind: that will is the product of reason and emotion, and is obedient to them in the perfect mind: that no one of the elements of mind exists without the others, and that all three are co-existent and co-equal in mind.

No man can be spiritually healthy except by the worship of the Creator as Archetypal Intellect, Archetypal Emotion, and Archetypal Will. The Doctrine of the Trinity is essential to the completeness of the conception of God, and yet is compatible with the purest monotheism. Christians worship Divine Intellect as God, the Father, infinite

in being, wisdom, truth, and justice ; they also worship Divine Emotion as God, the Son, revealing the Father as infinite in mercy, love, and sympathy ; and they worship Divine Will as God, the Holy Ghost, manifesting in action the might, and wisdom, and emotion of the Father and the Son.

“ Praise and glory to the Father,
Praise and glory to the Son,
Praise and glory to the Spirit,
Ever Three, and ever One ;
Consubstantial, co-eternal,
While unending ages run.”

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